COMMERCIAL FISHERIES Review

VOL 32, NO. 6 JUNE 1970

COVER: Landing a large yellowfin tuna off St. Vincent Island, B.W.I.
(A. C. Jones, BCF TABL Miami)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

FISHERMEN'S MEMORIAL--GLOUCESTER, MASS.

Managing Editor: Edward Edelsberg

Production: Jean Zalevsky
Alma Greene

The Bureau of Commercial Fisheries and
The Bureau of Sport Fisheries and Wildlife
make up The Fish and Wildlife Service of
The United States Department of the Interior.

Throughout this book, the initials BCF stand
for the Bureau of Commercial Fisheries.

Address correspondence and requests to: Commercial Fisheries Review, 1801 North Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-4246.

Use of funds for printing this publication was approved by the Director, Bureau of the Budget, April 18, 1968.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.
Price 60 cents (single copy). Subscription Price: $7.00 a year; $2 additional for foreign mailing.

CONTENTS

(R. K. Brigham)

NIXON PROPOSES WORLD TREATY TO SHARE SEABED RESOURCES

On May 23, President Nixon issued the following statement on U.S. Oceans Policy:

The nations of the world are now facing decisions of momentous importance to man's use of the oceans for decades ahead. At issue is whether the oceans will be used rationally and equitably and for the benefit of mankind or whether they will become an arena of unrestrained exploitation and conflicting jurisdictional claims in which even the most advantaged states will be losers.

The issue arises now--and with urgency--because nations have grown increasingly conscious of the wealth to be exploited from the seabeds and throughout the waters above, and because they are also becoming apprehensive about ecological hazards of unregulated use of the oceans and seabeds. The stark fact is that the law of the sea is inadequate to meet the needs of modern technology and the concerns of the international community. If it is not modernized multilaterally, unilateral action and international conflict are inevitable.

This is the time then for all nations to set about resolving the basic issues of the future regime for the oceans--and to resolve it in a way that redounds to the general benefit in the era of intensive exploitation that lies ahead. The United States as a major maritime power and a leader in ocean technology to unlock the riches of the ocean has a special responsibility to move this effort forward.

Therefore, I am today proposing that all nations adopt as soon as possible a treaty under which they would renounce all national claims over the natural resources of the seabed beyond the point where the high seas reach a depth of 200 meters (218.8 yards) and would agree to regard these resources as the common heritage of mankind.

The treaty should establish an international regime for the exploitation of seabed resources beyond this limit. The regime should provide for the collection of substantial mineral royalties to be used for international community purposes, particularly economic assistance to developing countries. It should also establish general rules to prevent unreasonable interference with other uses of the ocean, to protect the ocean from pollution, to assure the integrity of the investment necessary for such exploitation, and to provide for peaceful and compulsory settlement of disputes.

I propose two types of machinery for authorizing exploitation of seabed resources beyond a depth of 200 meters.

First, I propose that coastal nations act as trustees for the international community in an international trusteeship zone comprised of the continental margins beyond a depth of 200 meters off their coasts. In return, each coastal state would receive a share of the international revenues from the zone in which

it acts as trustee and could impose additional taxes if these were deemed desirable.

As a second step, agreed international machinery would authorize and regulate exploration and use of seabed resources beyond the continental margins.

The United States will introduce specific proposals at the next meeting of the United Nations Seabeds Committee to carry out these objectives.

Although I hope agreement on such steps can be reached quickly, the negotiations of such a complex treaty may take some time. I do not, however, believe it is either necessary or desirable to try to halt exploration and exploitation of the seabeds beyond a depth of 200 meters during the negotiating process.

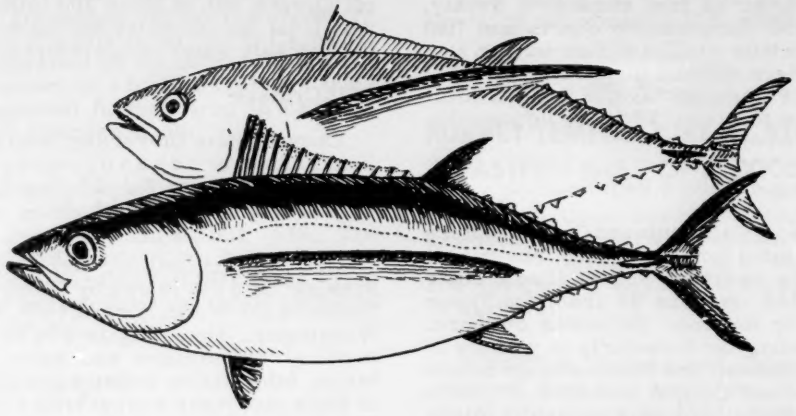
Accordingly, I call on other nations to join the United States in an interim policy. I suggest that all permits for exploration and exploitation of the seabeds beyond 200 meters be issued subject to the international regime to be agreed upon. The regime should accordingly include due protection for the integrity of investments made in the interim period. A substantial portion of the revenues derived by a state from exploitation beyond 200 meters during this interim period should be turned over to an appropriate international development agency for assistance to developing countries. I would plan to seek appropriate Congressional action to make such funds available as soon as a sufficient number of other states also indicate their willingness to join this interim policy.

I will propose necessary changes in the domestic import and tax laws and regulations of the United States to assure that our own laws and regulations do not discriminate against U.S. nationals operating in the trusteeship zone off our coast or under the authority of the international machinery to be established.

It is equally important to assure unfettered and harmonious use of the oceans as an avenue of commerce and transportation, and as a source of food. For this reason the United States is currently engaged with other states in an effort to obtain a new law of the sea treaty. This treaty would establish a 12-mile limit for territorial seas and provide for free transit through international straits. It would also accommodate the problems of developing countries and other nations regarding the conservation and use of the living resources of the high seas.

I believe that these proposals are essential to the interests of all nations, rich and poor, coastal and landlocked, regardless of their political systems. If they result in international agreements, we can save over two-thirds of the earth's surface from national conflict and rivalry, protect it from pollution, and put it to use for the benefit of all. This would be a fitting achievement for this 25th anniversary year of the United Nations.

INFORMATION FOR PACIFIC ALBACORE FISHING MAY BE BEST EVER



Albacore fishermen, buyers, processors, and other interested parties have been notified that advisory information to the albacore fishing industry this season promises to be the best on record. It will include "a forecast of the outlook for the 1970 season, daily broadcasts of albacore information over marine radio bands, temperature charts, fish bulletins, and early and late season scouting and survey cruises."

The information results from the cooperation of BCF Fishery-Oceanography Center at La Jolla, Calif., Oregon State University (OSU), Navy Fleet Numerical Weather Central at Monterey, Fish Commission of Oregon, California Department of Fish and Game, Washington Department of Fisheries, U.S. Weather Bureau, NASA, and albacore fishermen, buyers, and processors.

BCF Issues Forecast

A forecast of the outlook for the 1970 albacore season was issued by BCF in early June. It includes short-term projections of albacore distribution, oceanographic and atmospheric trends, and landings. Much environmental information used by BCF in albacore forecasting operations is made available through cooperation with the Navy at Monterey.

BCF and OSU Albacore Central are cooperating closely in daily broadcast over radio station WWD, licensed to BCF and located on campus of Scripps Institution of Oceanography at La Jolla, and Astoria Marine Operator (KFX, 2598 Khz). Broadcasts include latest albacore information from research vessels, cooperating fishing vessels, and unloading station operators. Broadcasts contain sea-surface temperature and other oceanographic and weather information that may be useful to albacore fishermen.

15-Day Temperature Charts

BCF is continuing decade-old practice of issuing 15-day sea-surface temperature charts from April 15 to October 31, or until season ends, for area roughly between central Baja California and Vancouver Island out to 135° W. A fish bulletin is issued with each temperature chart. This began about June 15 and will continue to end of season.

These bulletins include: information on oceanographic and atmospheric trends, locations of productive fishing areas, changes in market and unloading conditions that may affect effort.

Also, BCF is publishing a 30-day chart showing barometric pressure and wind direction and speed for the previous 30 days; and a chart showing 10-year average barometric pressure and winds for that month.

In addition, OSU Albacore Central again is issuing fish bulletins and sea-surface tem-

perature charts. These charts concentrate on small-scale features along Oregon coast out to 200 nautical miles as information becomes available. These probably will not be issued as often as last summer's weekly. BCF and OSU temperature charts and fish bulletins are bulk-mailed to fish-buying stations and others for hand distribution to fishermen. BCF and OSU have exchanged bulk-mailing lists to extend advisory information to more fishermen.

Calif. & Oregon Waters Best Scouted

This season, California and Oregon waters are best-scouted for albacore of any recent year. BCF's research vessel 'David Starr Jordan' sailed on June 22 from San Diego southwesterly to about 150 miles offshore. It is proceeding northwesterly to vicinity of San Juan Seamount, and then north up coasts of California and Oregon in waters of favorable temperature, probably about 150 miles off-shore. This track is flexible. It will be altered if necessary depending on early-June conditions. The cruise will end on July 3 in Newport, Oregon. Jordan will sail on for other studies.

Trolling During Cruise

Trolling for albacore during daylight is being carried out along entire track of scouting cruise. Each day's fishing begins where it stopped the day before. The thermo-salinograph is operating continuously. Information on mixed layer depth is obtained from XBT drops. Other oceanographic observations are made at night, including midwater trawl and zooplankton hauls. These will be used to obtain estimates of potential albacore forage; subsurface salinity and temperature observations are being made.

Jordan also will cruise in October to study where albacore exit the Pacific coast fishery--and what environmental condition accompany decay of albacore season.

Oregon Fish Commission Cruise

The Fish Commission of Oregon plans a 10-day charter cruise to scout for albacore in waters of favorable temperature off Oregon starting about July 1 aboard F/V 'Sunrise'. Between June 19 and July 3, Oregon State University research vessels 'Yaquina' and 'Cayuse' are occupying hydrographic survey lines off Oregon out to about 200 miles. Vessels will troll for albacore during daylight when in favorable water temperatures.

OSU Cruises

Oregon State University also plans additional albacore oceanography cruises on Cayuse off Oregon: July 27-Aug. 2, Aug. 7-12, Aug. 25-Sept. 1, and Sept. 8-14.

OSU will coordinate series of remote-sensing overflights by Coast Guard, Air Force, and NASA aircraft off Oregon and Washington. These flights will examine sea-surface temperature and water color patterns. Information collected will be included in daily messages and periodic bulletins. All fish reports from scouting vessels, negative as well as positive, will be incorporated into daily albacore advisory broadcasts over WWD and Astoria Marine Operator. The Jordan also will transmit her fishing reports to interested boats over normal fishing-boat frequencies. Her call letters are WTDK.

Everybody's Help Needed

The success of the cooperative albacore advisory program depends on the input of timely, first-hand information from fishermen at sea, dock operators, and processors. Insufficient information restricts quality and timeliness of the advisory materials.

Fishermen have been asked to aid the research programs that seek to learn more about the "distribution, abundance and availability of albacore tuna in the northeast Pacific Ocean." Satisfactory measurement of the biological aspects of the albacore tuna populations and the effects of varying economic conditions have lagged far behind progress in monitoring and understanding the environment. Little progress has been made in estimating year-class strength, apparent fish abundance, and fishing effort for albacore. The fishermen can help by keeping logbook records.

'ALBATROSS IV' SURVEYS GROUNDFISH OFF ATLANTIC COAST

BCF's Albatross IV has completed its annual spring groundfish survey from western Nova Scotia to Cape Hatteras, North Carolina. A "quick appraisal of the unprocessed field logs"--compared to spring 1969's--"indicates an expected further drop in haddock abundance on Georges Bank."

On the optimistic side, catches of young silver hake in Southern New England were "definitely greater" than in fall 1969. The fall 1969 catch of young silver hake also was considerably higher than fall 1968 catch. This indicates the hake population should increase in the near future.

New Stations Occupied

In addition to the standard survey stations on Georges Bank, 2 more series of stations were occupied to monitor progress of haddock spawning. The area closed to commercial fishing was included.

Maturity stages of haddock were examined. By mid-April, spawning was well along on Georges Bank--but had not yet begun on Browns Bank.

COAST GUARD-BCF ICNAF RESEARCH CRUISE UNDERWAY

On May 19, USCGC 'Rockaway' departed Norfolk, Va., to conduct an oceanographic survey of coastal waters between Nova Scotia and Cape Hatteras, N.C. It will end June 14. It is eighth in a series to support fishery research program of International Commission for Northwest Atlantic Fisheries (ICNAF).

International Program

This cooperative undertaking involves study of offshore fishery resources fished by U.S. and other member nations. The aim of the international program is to seek an understanding of natural fluctuations in abundance of commercial fishes and to assess effects of fishing.

BCF Biological Laboratory, Woods Hole, Mass., is coordinating U.S. efforts.

SURVEY TEMPERATURE IN ATLANTIC & EASTERN GULF OF MEXICO

The U.S. Coast Guard Oceanographic Unit extended its Airborne Radiation Thermometer (ART) coverage into Gulf of Mexico during late April-early May 1970 to support EGMEX-70 surveys.

EGMEX is a combined, long-range program of Federal, state, and local oceanographic facilities to study eastern Gulf of Mexico.

During EGMEX-70, scientists and technicians are studying the Gulf Loop Current.

Loop Important

The Gulf Loop Current, a branch of the Yucatan Current, interests marine scientists and sport and commercial fishermen because of its influence on fish distribution. It enters the Gulf of Mexico through the Yucatan Straits, flows north towards Louisiana, bends east towards Panama City, then south along Florida's west coast to the Straits of Florida; there, it joins the eastward-flowing Florida Current.

Monthly ART Flights

The Coast Guard conducts monthly ART flights on U.S. East Coast from Cape Cod to Miami, Florida. Monthly charts depicting surface temperature contours and marine-animal observations are mailed to fishermen, universities, and government agencies on request from: Oceanographic Unit, Bldg. 159-E, Navy Yard Annex, Washington, D. C. 20390.

NEW ENGLAND FISHING FUTURE LOOKS GOOD TO BANK OFFICER

Allen P. Keith Jr., waterfront loan officer for the Merchants National Bank of New Bedford, Mass., says the future of the New England commercial fishing industry looks good to him. "People have to eat. And as long as they do, New England fishermen will be able to sell all the fresh fish they can catch. Fishing isn't an easy business, it never was, but you can still make a doggone good living at it."

Mr. Keith's views appeared in the April 1970 New England Marine Resources leaflet. His bank probably handles more fishing boat mortgages than any other bank in New England. He has specialized in them for nearly 7 years and knows the local fishery intimately.

Foreign Competition

He emphasizes that he does not underrate competition from foreign fleets, but he maintains that "we still have the fresh fish market, and fresh fish will always be preferred. That's what keeps New Bedford going. Our fleet can sell everything they bring in."

Boats & Men Aging

He worries about aging men and boats. "It's too bad that more young men are not following in their dad's footsteps, because once a man goes into fishing, he rarely leaves it."

The age of most commercial fishing vessels is an even greater problem--one that can never be solved without great government aid, he says. He points out that 80% of boats fishing out of New Bedford are "overage"; the situation is even more critical in Gloucester.

Painful Economics

The figures explain why. To replace an overage $30,000 vessel today would cost around $150,000. Private dollars cannot handle the modernization of entire fleets, Keith points out. He sees U.S. subsidies as necessary to keep industry going.

He and others feel that insurance rates on fishing vessels must be lowered. A boat owner has to pay $8,000 to $10,000 a year in insurance before he even brings in his first catch.

His bank handles many loans that are insurance loans. It will finance them up to 75%; for many fishermen, this is a lifesaver.

Boat Mortgage Loans

A larger proportion of his business is in boat mortgage loans. The average one is for a $150,000 vessel. Interest runs between 8½ and 9%. In the first three months of 1970, the bank has had 20 such loan applications; 6 were accepted.

The bank has standards for accepting or refusing a mortgage application. The most frequent refusal is for age of boat. After 7 years, Keith points out, there is always danger of engine trouble, which is expensive. A new engine costs $40,000 to $50,000; installation costs another $8-10,000. Putting a new engine in an old boat is throwing good money after bad, the bank believes. It is reluctant to lend money for a secondhand boat.

Size and design of vessel also are important. The bank won't touch a boat under 65 feet because it would not be practical for winter fishing. And year-round use is a necessity if it is to be profitable.

Design also influences bank's decision: "A boat that can't be converted easily from one kind of fishing to another just isn't efficient."

To get a boat mortgage loan from his bank, the applicant's home port must be New Bedford. His boat must be documented there and buy its supplies there, though it may go afield to fish, if necessary. Keith says, "my job is to finance the port of New Bedford."

Personal Criteria

Among personal criteria of loan applicant on which bank makes its decision are age, experience, and character. The youngest captain for whom Keith wrote a loan was 25. Before the bank lends a man money to go into fishing for himself, it wants him to show "a few year's experience, either as a captain or a mate, and to show some indication that he's a 'producer'."

Three mainstays of fishing industry: skilled hands and nylon net. Average age of fishermen continues to rise as too few youths choose the sea. Nylon makes possible large nets and large catches. (Photo: Rex Gary Schmidt)

However, the percentage of capital the applicant must put up that is his own money does not influence the bank's decision. The length of mortgage varies from 3 to 5 years on a secondhand boat to 7 years on a new one to 10 years on a subsidy vessel.

Keith Offers Advice

For would-be fishing boat owners, Keith offers other useful tips. "Go to a good, reputable bank for your loan and be sure you go with a concrete, worked-out plan to show them. Very few banks do as much boat mortgaging as we do; they're not familiar with the fishing industry and they won't even listen to you if you don't have a firm program to show them."

He also advises anyone planning to acquire a boat to incorporate before he does so. "If you own it as an individual," he explains, and something goes wrong, you can lose your car and everything else you own."

It is also advisable to apply for a mortgage before starting to build. Government mortgage insurance should be applied for while boat is still in planning stage. It costs 1% of mortgage and diminishes proportionately as mortgage is paid.

Ordinarily, the bank does not loan money to fishermen for working capital. But Keith says this isn't a severe handicap because credit for equipment and supplies usually is readily available.

Keith's most valuable advice to young men going into commercial fishing is: "Be adaptable. Don't make up your mind you're going to do just one kind of fishing and have your boat built for that. I know of one new boat that can lobster, crab, seine, bottom trawl and midwater trawl, and she is easy to convert from one kind of fishing to another. That means she is one hundred per cent usable." This same boat, Keith adds, has not suffered, as many in the fleet have, from haddock shortage. It is simply converted to seining for herring, which is immensely popular in Europe, but almost entirely fished out in the North Sea. "They can't fill their foreign orders," he says.

"The fishing industry isn't standing still," Keith concludes. "As long as you keep diversifying, you have some place to go."

'BOWERS' EXPLORES FOR SCALLOP OFF FLORIDA'S EAST COAST

BCF's exploratory fishing vessel George M. Bowers arrived at St. Simons Island, Georgia, on April 27 after 21 days of scallop exploration off Florida's east coast. It was the second in a series of scallop-stock assessments using the Remote Underwater Fisheries Assessment System (RUFAS). The vessel is part of the BCF Exploratory Fishing and Gear Research Base in Pascagoula, Miss.

Cruise Purposes

The cruise's principal objectives were to "evaluate the current calico scallop occurrence in the area; locate areas of highest yield potential; provide demonstrations of survey equipment, monitoring procedures and sample dredging operations for industry observers, and to further evaluate the modified survey equipment's capabilities in the time available."

15 Transects

15 transects were run in an easterly or westerly direction covering 156 miles. Transects were established on major loran lines and were run between the 15 and 25 fathom curve. The loran lines covered were from 3H7-1700 (east of Malibar, Florida) to 3H7-3200 (northeast of St. Augustine, Florida).

Bottom visibility with TV camera was exceptionally good. It exceeded 20 feet on many transects. On only one transect (3H7-2200) was visibility less than 5 feet.

Heaviest Concentrations

Preliminary evaluation of the video tapes indicates heaviest scallop concentrations on this survey were off Cape Kennedy between 3H7-2100 and 3H7-2400 along 19 to 25 fathom curves. Scattered scallops were observed on most other transects. For the most part, scallops were settled individually in small conical depressions in sandy substrate--or were lying singularly or in small groupings at bottom of furrows crossing transects at northwest-southeast direction. When 2650 feet of 35 mm film are processed, a more detailed evaluation will be possible.

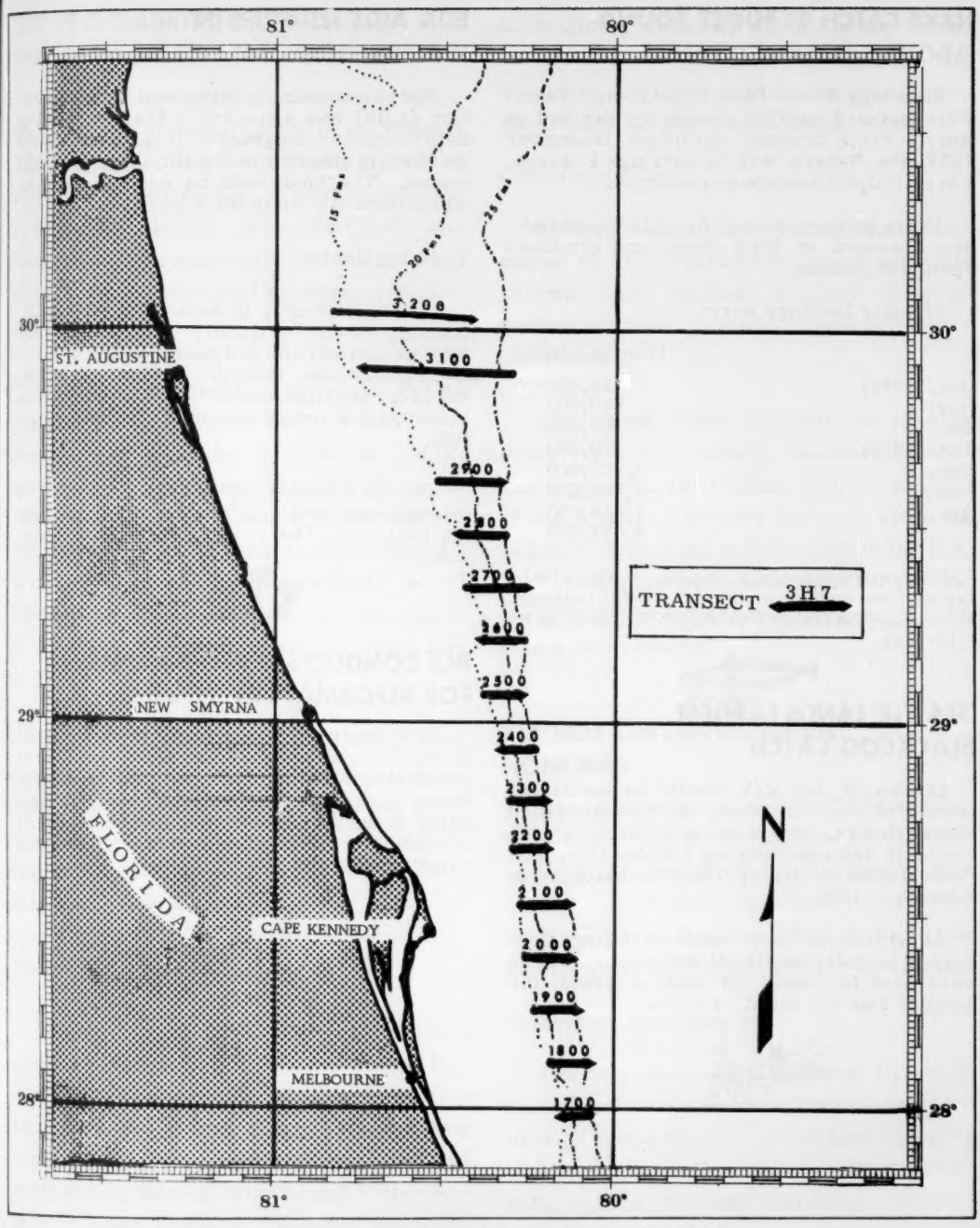
Sled System Improved

The sled system showed marked improvements over 1969 fall survey. Numerous modifications provided increased maneuverability and improved visual observation. As facility was gained on launch and recovery techniques, procedures became routine, with no noticeable strain to system.

During the day, television monitoring of the sea floor was done without artificial lighting. Two night-time transects, however, required dysprosium light; at times this gave a pronounced back-scattering effect that obscured video image. It was found that guiding the sled very close to the substrate greatly reduced this problem.

A one-day RUFAS demonstration was provided for four industry observers; fishing information and assistance were provided two scallop vessels.

(Map following page.)



R/V George M. Bowers, Cruise No. 90, April 7-27, 1970.

HAKE CATCH IN PUGET SOUND ABOUT 8 MILLION POUNDS

Landings of hake from Puget Sound (Wash.) were about 8 million pounds by the end of April. From October through December 1969, the fishery was in Saratoga Passage, where 600,000 pounds were caught.

From January through April 1970, the fishery operated in Port Susan and produced 7,400,000 pounds.

Monthly landings were:

	Pounds Landed
Oct. (1969)	134,000
Nov.	370,000
Dec.	100,000
Jan. (1970)	190,000
Feb.	1,922,000
Mar.	3,863,000
Apr.	1,454,000
	8,033,000

One or two vessels planned to continue fishing as long as they made successful catches. Normally, the fishery in Puget Sound ends by mid-May.

'SEATTLE' LANDS LARGEST BLACKCOD CATCH

On May 6, the M/V Seattle landed 24,432 pounds of blackcod using the BCF-modified king crab pots. This was the Seattle's largest catch. It was made during a 9-day trip. The vessel began pot fishing trials for blackcod in November 1969.

About two-thirds the catch were large fish: over 5 pounds, heads off and gutted. These were sold for about 28 cents a pound; the smaller fish for about 14 cents.

EDA AIDS FISHERIES IN WASHINGTON

The Economic Development Administration (EDA) has approved a $24,900 grant to help continue a program to train workers for the fishing industry in Pacific County, Washington. The funds will be used to help pay administrative costs for a year.

Training Center

Chinook, Wash., is establishing a skill-training center to qualify young people for jobs in commercial and sport fishing and related industries. In addition to marine skills, the program includes conservation courses to increase the area's supply of fish and shellfish.

The 13 students who have completed courses have been employed in the local fishing industry. The program now has 36 students.

BCF CONDUCTS SEAFOOD SEMINAR FOR REFORMATORY YOUTHS

BCF Seattle personnel conducted a retail seafood seminar for meatcutter trainees at the State of Washington Monroe Reformatory. When released, each young man who participated in the seminar will be offered a job as a meatcutter (and seafood counter man) in a retail market.

TEST PROFITABILITY OF FARMING SHRIMP IN SALTWATER PONDS

An attempt to test the profitability of farming shrimp in saltwater ponds in the Coastal Plains Region of eastern U.S. will start soon near Dale, South Carolina. It will be conducted by Walter F. Lubkin Jr. of Beaufort, S.C., who wants to put to commercial use the aquaculture techniques developed by research biologists.

This was reported by the Coastal Plains Regional Commission (CPRC), a U.S. partnership with Georgia, S. Carolina and N. Carolina. It is sponsoring this one-year economic feasibility demonstration under a guarantee-against-loss agreement. Job will be conducted with the technical assistance and supervision of biologists of the Division of Commercial Fisheries, South Carolina Department of Wildlife Resources.

Brown and white shrimp have been selected for cultivation because research at Bears Bluff Laboratory in South Carolina and elsewhere has shown these species adaptable to impounded conditions. Also, they are available locally and have high market value.

Shrimp No. 1 in Value

Shrimp is the most valuable of all seafood species harvested in the Coastal Plains Region. In recent years, the demand for shrimp (and price per pound) has been increasing much faster than supply. Between 1967 and 1969, shrimp harvested in Coastal Plains Region of South Carolina, Georgia, and North Carolina jumped from 16 million pounds to 22 million pounds; its value doubled--from $6.5 million to $13 million. Although the U.S. consumes about $400 million of shrimp a year, only half is caught by U.S. fishing fleet.

Commission Goal

Successful application of aquaculture techniques to cultivation of brown and white shrimp would increase Region's share of shrimp market. It would create more jobs and income.

The Coastal Plains Regional Commission seeks "to induce orderly, accelerated economic growth in 159 Coastal Plains counties" of the 3 states. CPRC's goal is to close its region's income gap with the rest of the U.S. "by creating favorable conditions for private investment through a planned program of economic development."

BCF FILM ON ENVIRONMENT HONORED

'The Biologist and the Boy' has won for BCF a certificate of "creative excellence" from the U.S. Industrial Film Festival. It is one of two films on pollution produced by BCF's Elliot A. Macklow, Chief, Audio-Visual Services, in cooperation with the 5 Gulf States.

Nationwide Distribution

The film was recently renamed 'Crisis on the Coasts'. It will be distributed to theaters through United Artists: in New York City area on May 29, in San Francisco and Washington, D.C., in June, and later nationally.

FISH AND WILDLIFE SERVICE EXPANDS ALASKAN ROLE

The Department of the Interior's Fish and Wildlife Service (FWS) is expanding its work in Alaska, Secretary Hickel has announced. This recognizes the State's wildlife and fisheries resources--largest in the Nation--and the need for effective State-Federal cooperation to conserve them, Mr. Hickel said.

BCF has established a fisheries center at Kodiak. A Navy facility is being renovated to house research and office personnel. Located there also will be BCF's Alaska Associate Regional Director for Fisheries, who will supervise BCF research programs throughout the State.

Sport Fisheries Bureau Expands

An Area Office for the Bureau of Sport Fisheries and Wildlife (BSFW) will be established in Anchorage, effective July 1, 1970. It will coordinate and direct BSFW's efforts in Alaska to protect and enhance the important sport fish and wildlife populations.

Charles H. Meacham, FWS Commissioner, said: "Economic changes, population growth and natural resources development have created increasing problems which require additional effort in Alaska. A particular advantage in having an Alaska Area Office is the greater facility for direction and coordination of future BSFW programs and planning with the Alaska Department of Fish and Game. BSFW will now have in Alaska an office with decision-making capability to serve State agencies and the general public."

TAGGED FISH SORTED AUTOMATICALLY

A device to detect and sort out adult migrating salmon that were tagged as fingerlings with coded magnetic wire tags has been operating successfully since late April 1970 in an Ice Harbor Dam Fishway on the Columbia River. By May 14, the device had detected and segregated 109 tagged fish.

LABS COMPARE THEIR ANALYSES OF INSECTICIDE RESIDUES

Several laboratories analyzing insecticide residues in the Great Lakes are participating in an interlaboratory quality-control check sponsored by BCF.

Trout & Salmon Sampled

A lake trout and a coho salmon from Lake Michigan were ground and frozen. Samples were shipped to the laboratories to be tested for insecticide residues. The results will be compared. If there are differences, methods will be checked to determine the reason--and corrections made to insure standard results.

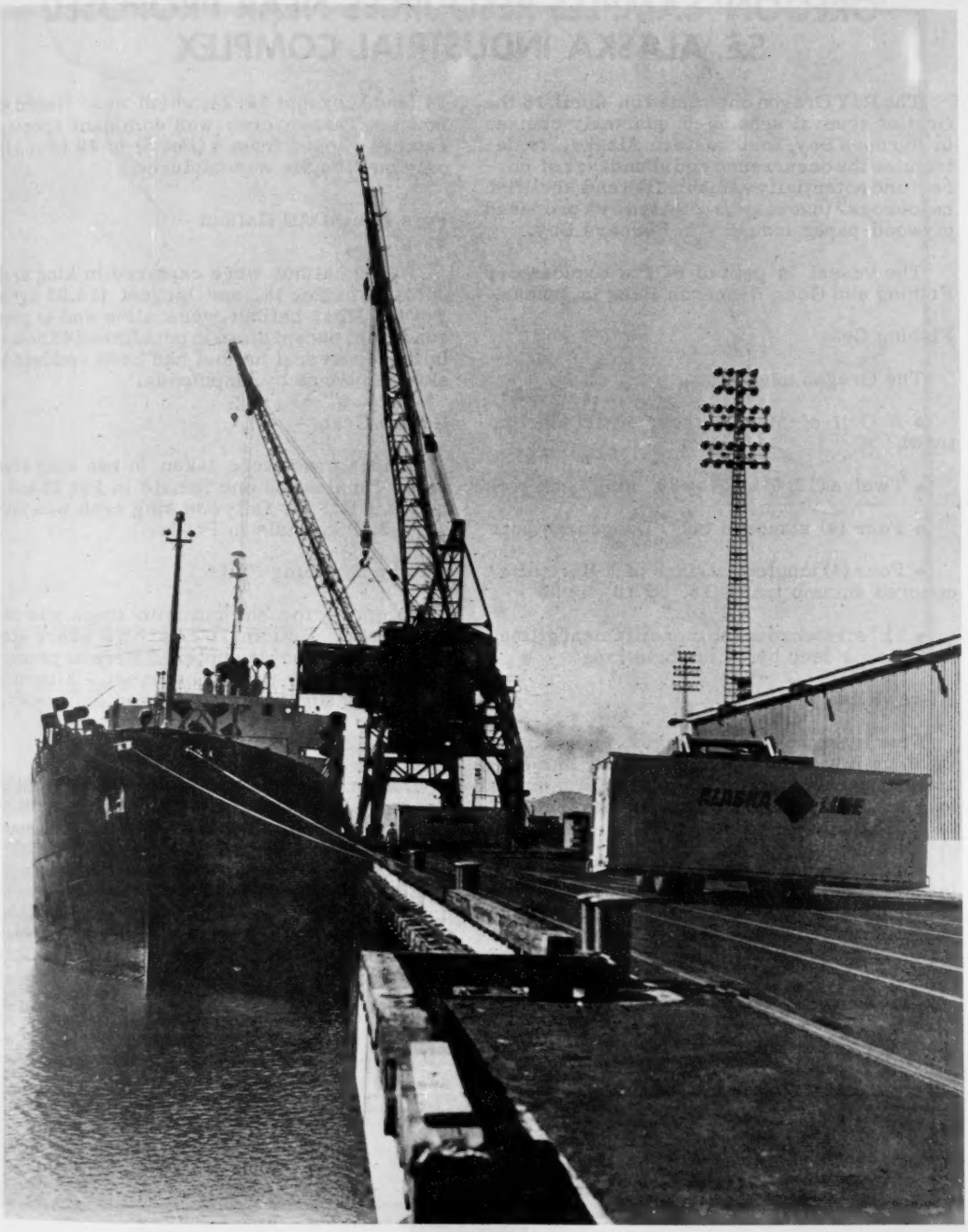
ARMY ENGINEERS TO WEIGH ENVIRONMENT MORE

U.S. Army regulations governing permits for work in navigable waterways will give greater emphasis to environmental values. This was announced May 19.

The impact on the public of the proposed work will be evaluated to include such factors as fish and wildlife, water quality, economics, conservation, esthetics, recreation, water supply, flood damage prevention, ecosystems, and, in general, the needs and welfare of the people, as well as navigation.

FIRST WORLD FISH STANDARD DISTRIBUTED FOR ADOPTION

On April 1, 1970, the Directors-General of the Food and Agriculture Organization and the World Health Organization transmitted to U.S. State Department the first of a series of recommended international food standards for acceptance by member and associate member nations. Among the standards are an International Standard for Canned Pacific Salmon, an International General Standard for Labeling Prepackaged Foods, and International Tolerance for Pesticide Residues.



Ocean-going vessels are used to transport Alaska's fishery products. Seward. (J. M. Olson)

'OREGON' SAMPLES RESOURCES NEAR PROPOSED S.E. ALASKA INDUSTRIAL COMPLEX

The R/V Oregon completed on April 18 the first of several scheduled quarterly cruises in Berners Bay, Southeastern Alaska, "to determine the occurrence and abundance of current and potentially valuable fish and shellfish resources" that may be affected by a proposed plywood-paper industry in Berners Bay.

The vessel is part of BCF's Exploratory Fishing and Gear Research Base in Juneau.

Fishing Gear

The Oregon used:

- A Gulf-of-Mexico-type, 40-ft. shrimp trawl
- Twelve (12) 6' by 6' by 30" king crab pots
- Four (4) standard (42") Dungeness pots
- Four (4) longline strings of 3 Herculite-covered shrimp traps (18" by 18" by 30")
- $1\frac{1}{4}$" stretched mesh monofilament gillnet, $1\frac{1}{3}$ fathoms deep by 10 fathoms long

5 Trawl Hauls

Five trawl hauls were made, three within Berners Bay and two in Lynn Canal, immediately adjacent (chart). Hauls were 30 minutes long in 42-82 fathoms within the bay, and 158 to 163 fathoms in Lynn Canal.

Species varied more in trawl catches than in other gear. Commercially important species occurring in highest abundance were sablefish and golden crab in Lynn Canal, hauls 3 and 4, and starry flounder in Slate Creek Bight, haul 5.

King Crab Pots

Thirty king crab pots were set, all within bay, in 28 to 111 fathoms. All pots were fished 24 hours, except 19-24, which were fished 48 hours. Tanner crab was dominant species; catches ranged from 1 (Pot 5) to 19 (Pot 17); only one female was captured.

Pots Caught All Halibut

All 32 halibut were captured in king crab pots: 4 in Pot 16, and largest (14.93 kg) in Pot 8. Most halibut were alive and in good condition, except those in pots fished 48 hours. In those, several halibut had been reduced to skin and bones by amphipods.

Golden Crab

Golden crab were taken in two king crab pots: 4 males and one female in Pot 22 and 3 males in Pot 24. Only one king crab was taken, a 3.39 kg male in Pot 2.

Shrimp Sampling Fails

Sampling for shrimp with traps was unsuccessful. Bottom locations where spot shrimp might be encountered were so precipitous that gear could not be set. Alternate locations caught only snails and amphipods.

Dungeness Crab Pots

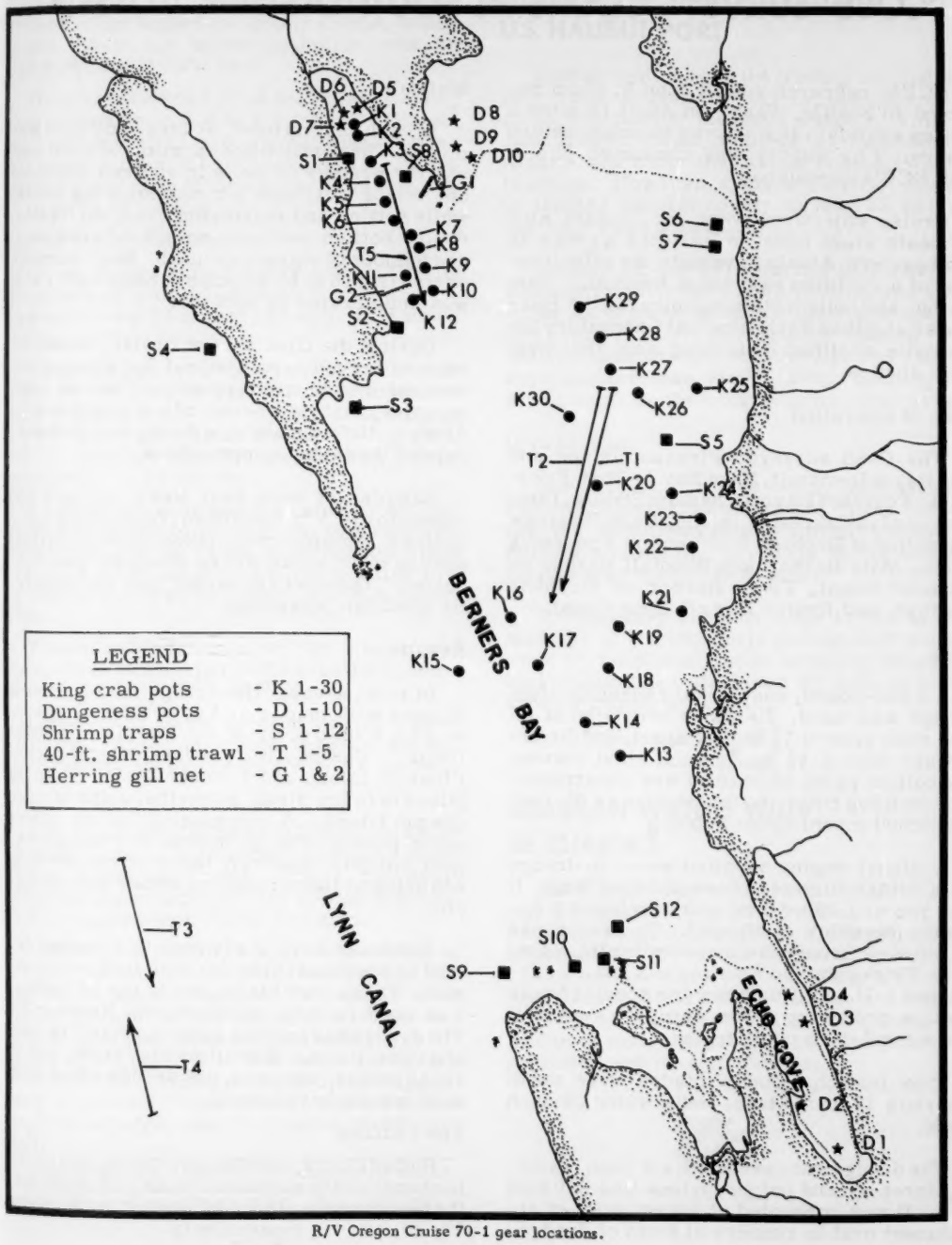
Dungeness crab pots were set in Echo Cove, Slate Creek Bight, and off mouth of Berners River. Pot 3 captured 16 male Dungeness crab and Pot 4 captured 8 males and one female; these were set near mouth of Echo Cove in 10 to 12 feet. One Dungeness crab was taken in Pot 1 set at head of Echo Cove in 40 feet. Yellowfin sole and spider crab were only other organisms taken in Dungeness pots.

Gillnets Yield Herring

Two gillnet sets in Slate Creek Bight produced 9 herring and 2 capelin.

For further information contact: Base Director, BCF Exploratory Fishing and Gear Research Base, P. O. Box 1668, Juneau, Alaska 99801.

(Map following page.)



R/V Oregon Cruise 70-1 gear locations.

'COBB' SURVEYS CLAMS IN SOUTHEASTERN ALASKA

BCF's research vessel John N. Cobb returned to Seattle, Wash., on April 16 after a 32-day subtidal clam survey in southeastern Alaska. The survey was conducted jointly with BCF's Juneau base.

Cruise objectives were to: "locate and delineate clam beds in selected areas in southeastern Alaska, evaluate the effectiveness of a modified east coast hydraulic clam dredge, and collect clam samples for the Bureau's Ketchikan Technological Laboratory for paralytic shellfish poisoning and the meat yield studies."

Area of Operation

The Cobb surveyed Pleasant Island and Mud Bay in Icy Strait, Neka Bay in Port Frederick, Tebenkof Bay off Chatham Straits, Duncan Canal in Kupreanof Island, Cape Fanshaw at junction of Stephens Passage and Frederick Sound, Mole Harbor and Windfall Harbor on Seymour Canal, Taku Harbor on Stephens Passage, and Funter Bay off Lynn Canal.

Gear

A 2,250-pound, east-coast hydraulic clam dredge was used. Its sides consisted of $\frac{7}{16}$-inch rods spaced $1\frac{5}{8}$ inches apart, and the aftercage with a $1\frac{3}{4}$ by $1\frac{3}{4}$-inch steel screen. The bottom panel of cod end was constructed of 2-inch hog rings; the top panel was $3\frac{1}{2}$-inch (stretched mesh) nylon webbing.

A diesel engine supplied water to dredge via a 6-inch-diameter hose 285 feet long. It was run at 1,550 r.p.m. and developed a hydraulic pressure of 80 p.s.i. The water was distributed through the main hydraulic manifold. This contained 7 cutting jets and 3 washout jets. The cutting jets were special brass nozzles producing a flat spray; the washout jets were $\frac{3}{4}$-inch pipe nipples.

Two interchangeable blades were used: a narrow 18-inch blade, and a wider 36-inch blade.

The dredge was towed with a 2-inch, twisted, three-strand polypropylene line 260 feet long. It was connected at lowest point of attachment next to runners at front of dredge.

Methods

In each bay and inlet, at least one haul was made. The position and duration of each haul and the number of hauls in an area depended on: space available for maneuvering vessel while setting and retrieving gear, the bottom depth, bottom contour, nature of substrate, and number of clams captured. Haul duration varied from 5 to 15 minutes. Each haul catch was enumerated by species.

During the first part of cruise, scuba divers observed trenches cut by dredge, inspected bottom substrate, collected clam samples, and estimated clams missed by dredge. Unfortunately, a diving accident suspended these diving operations.

Samples of each haul were retained and frozen for BCF's Ketchikan Technology Laboratory. Samples were taken from intertidal zone in most areas where dredging was conducted. These will be tested also for paralytic shellfish poisoning.

Results

In most areas, "the dredge would become plugged with mud, rocks, boulders, watersoaked wood, or a combination of these items." The only two productive areas were Pleasant Island and Tebenkof Bay. Pleasant Island is in Icy Strait at northern end of Chichagof Island. A communication or power cable passes through middle of Pleasant Island grounds; however, there is enough area and depth to fish dredge on either side of cable.

Ten hauls were made next to Pleasant Island on southwest side of cable in 6 to 8 fathoms. The narrow blade, set to dig 14 inches, was used in these hauls, except Number 30. The dredge had trouble clearing itself of mud and worm tubes. When the wider blade, set to dig 10 inches, was used, the dredge filled with mud and anchored itself.

The Catches

Butter clams, Alaska surf clams, and cockles occurred in almost all hauls. Of all clams, the percentages of each of these species were 22, 25, and 10, respectively.

Catch rates of clams varied significantly by haul. The highest of butter clams, which ranged 2.6 to 4.4 inches in height, was 58 clams per 15-minute haul.

The largest catch rate of Alaska surf clam, which ranged from 1.8 to 5.9 inches in height, was 54 clams per 15 minutes of towing. Cockles, ranging from 2 to 4.6 inches wide, were taken in the dredge at rate up to 17 clams per 15 minutes of towing.

Narrow & Wide Blades

On northeast side of cable area, 17 hauls were made in $5\frac{1}{2}$ to 12 fathoms: 6 with narrow blade set to dig 14 inches; 11 with wide blade set to dig 10 inches.

When using narrow blade, vessel had to be taken out of gear to slow it. This indicated narrow blade was not digging into bottom. However, the wide blade seemed to dig well; with full throttle, the Cobb moved the dredge only $\frac{1}{10}$ mile in 15 minutes.

Another indicator was the catch. Cockles, which are known to be near top of substrate, comprised 43% of catch when narrow blade was used. The largest catch of cockles in a 15-minute haul was 15 clams 2.3 to 4.2 inches wide.

When wide blade was used, the Alaska surf clam, which lies deeper in the substrate, dominated the catch: 90% of total.

Catch rates were as high as 345 clams per haul. About 90 clams made a bushel; their heights ranged from 1.9 to 5.6 inches.

Tebenkof Bay

The bay is located on Kuiu Island and faces Chatham Strait. It includes 3 smaller bays: Thelis, Elena, and Petrof. Thelis, relatively deep, was unproductive. The dredge normally was clogged with rocks and mud.

In Elena and Petrof, 9 hauls were made at 4 to $13\frac{1}{2}$ fathoms. The bent-nosed clam was only clam taken in abundance. Catch rates varied from 17 to 343 clams per 10 minutes of hauling. Specimens ranged from 1.5 to 4.5 inches in height. About 340 clams made up a bushel. The bottom in these two bays apparently is quite soft because there was no resistance on dredge, and it cleared itself very well.

For further information contact: A. T. Pruter, Acting Base Director, Exploratory Fishing and Gear Research Base, 2725 Montlake Blvd. East, Seattle, Wash. 98102. (Phone: 583-7729)

ALASKA'S KODIAK IS LEADING U.S. HALIBUT PORT

Kodiak continues as the leading U.S. halibut port: this season, to May 15, landings were 1,223,000 pounds (dressed weight). This is 73% greater than landings at Petersburg, Alaska, and more than triple Seattle (Wash.) landings. However, Canada's Prince Rupert is leading Pacific coast: to May 15, halibut landings were 2,184,000.

To May 15, the 1970 North Pacific halibut landings from Areas 2 and 3A at U.S. and Canadian ports were about 6 million pounds--up 62% over same date during 1969 season. The 1970 season opened on April 25, 11 fishing days earlier than May 7, 1969, opening for Areas 2 and 3A, the 2 major production areas.

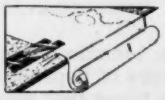
1970 Quotas

The 1970 catch quotas set by International Pacific Halibut Commission for these two areas are 20 million pounds for Area 2 and 30 million pounds for 3A. This is one million pounds less than 1969 quotas.

Preliminary records show total halibut landings at Pacific ports during 1969 season were 58.4 million pounds (dressed weight)--25.1 million pounds taken by U.S. and 33.3 million pounds by Canada.

ALASKAN WATERS WILL BE CHARTED

Six Seattle-based ships of ESSA's Coast and Geodetic Survey (CGS) will chart and map Alaskan waters this year. CGS will gather information needed to prepare up-to-date charts of the waterways leading to ports of Anchorage, Sitka, and Ketchikan; and for detailed maps of the sea bottom of Bering Sea, Norton Sound, and the Gulf of Alaska for exploration and marine studies.



RESEARCHERS PERFECT SURGICAL PROCEDURE FOR FISH

Science will benefit from a fish surgery procedure perfected by researchers of the Bureau of Sport Fisheries and Wildlife (BSFW). The procedure permits scientists to see internally the success or failure of research efforts.

Assistant Secretary Leslie L. Glasgow, who heads Interior's programs for fish, wildlife, and parks, said: "Fish are sensitive indicators of both favorable and harmful elements, and the surgical procedure allows scientists to get first hand views of the effects of the elements on live specimens." The procedure enables researchers to keep fish alive after one or more operations--so they can be used in continuing lab research. More than 98% of the fish operated on recover afterward.

Researchers in medicine, toxicology, pharmacology, veterinary science, and nutrition can benefit from using fish in their experiments, Dr. Glasgow noted.

Background of Research

BSFW researchers developed the technique to inspect damage to fish's diseased organs and to see how therapeutic drugs and special diets help. It is part of the Bureau's research program to develop healthier fish for planting in U.S. waters.

In the late 1940s, Dr. O.H. Robertson of Chicago University pioneered surgery on fish. In the early 1960s, BSFW put together a team headed by Dr. John E. Halver to establish fish surgery as a standard laboratory procedure for test purposes.

By the late 1960s, the technique had been standardized sufficiently for routine use by scientists at BSFW's Western Fish Nutrition Laboratory at Cook, Washington, and its field station at Hagerman, Idaho. The technique helped amass information on fish nutrition, health, and capability of growing or developing in different environments.

In 1968, the technique produced a major success in the cure of hepatoma--a liver cancer in rainbow trout that was threatening to destroy U.S. trout culture. Internal inspection of diseased fish enabled BSFW scientists to isolate a mold in commercial fish feed as the cause. By advising improved preparation and storage procedures in manufacturing the fish food, BSFW scientists eliminated the disease from trout hatcheries.

The Surgical Technique

At the BSFW laboratory, conventional surgical instruments and sutures are used. The fish receive light and deep anesthesia for the operation, which can last 5 minutes to several hours. Special probing tools inspect the vital organs and can remove diseased tissues for special analysis.

Teams of surgeons operate in a special room to which fish are sent on a conveyor. The fish's head is kept immersed to permit gills to extract vital oxygen during the operation; also, skin is kept moist to prevent injury. Special plastic tags are applied to identify each "patient."

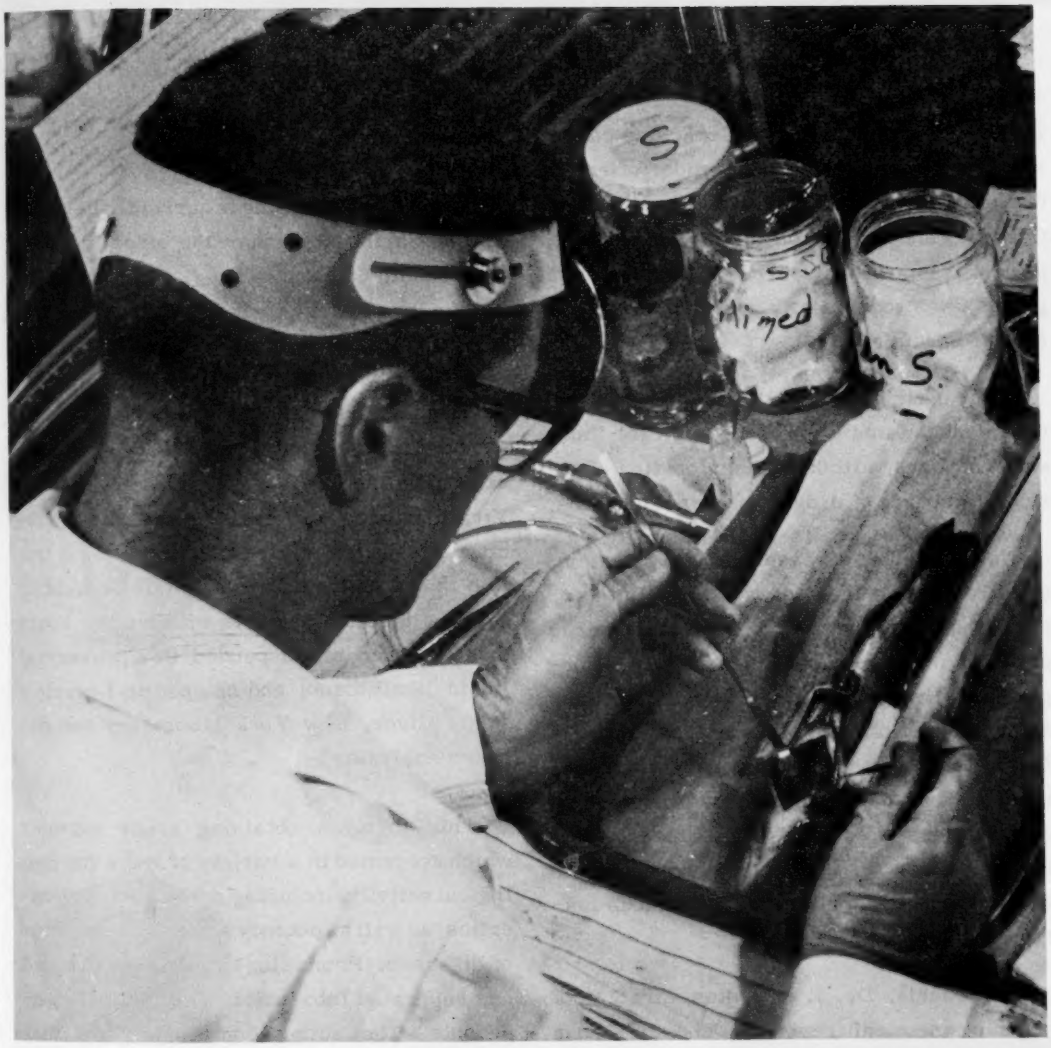
Incisions usually are made on the belly side, but other sites are possible. After internal inspection, an antibiotic is applied to prevent infection, sutures are sewn, and the fish is placed in a special postoperative tank for one to several hours. Then it is placed in a special recovery tank; after 3 days, it is able to accept food.

The procedure permits internal inspections at intervals of 3 or more months. So the scientists are able to see changes for better or worse over a considerable period.

Over 10,000 Operations

Over 10,000 operations have been performed at the BSFW laboratory. Less than 2% of fish have died from either trauma or other postoperative complications. Those that recover show only a slight scar and can be operated on again. Primarily rainbow trout have been used, but researchers have been successful too with salmon, carp, and catfish.

BSFW researchers are convinced that proper diet and selective breeding can produce in fish disease resistance, faster growth, and greater tolerance of unfavorable environmental conditions, such as heat. And, as a result of these factors, healthier fish can be grown for planting.



Surgery is performed on fish under hospital conditions to find out how organs are affected by certain diseases. The fish recover. (Photo: N. Mariana, BSFW)

DRUGS FROM THE SEA

New healing drugs have long been hunted and often found in the most unlikely places. Penicillin originated on the overripe cantaloupe; chloramphenicol, the most effective drug against typhoid fever, originally came from a Venezuelan soil mold. Cephalothin, a new weapon against penicillin-resistant germs, was found near a sewer outlet in the sea off Sardinia.

Although the medicinal properties of some ocean inhabitants have been known for thousands of years, no thorough exploration of the sea as a source of drugs has ever been made.

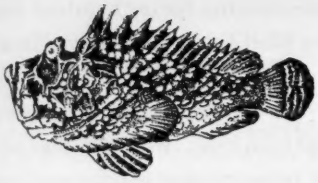
Now a number of researchers are systematically seining the oceans with definite expectations that the next generation of drug products may be derived from the natural organisms living there. At least two drug companies, Hoffman-LaRoche and Lederle Laboratories, have undertaken full-scale collecting and research programs. And several universities, including the University of Rhode Island, are involved in investigations of the medicinal properties of various marine organisms.

At Lederle, Dr. J. J. Denton, director of organic chemical research, and Dr. John Webb, head of the laboratory's structure and analysis department, explained some of the objectives of their firm's year-old research program. Its prime aim, they say, is to isolate and evaluate marine plant and animal life in order to develop new therapeutic agents. Previous investigators of the sea were usually looking for a specific pharmacological activity. The present research involves collecting any likely looking specimens and testing them for a variety of properties.

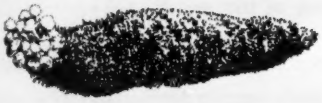
Lederle's collecting is currently centered in the Caribbean, under the direction of its consultant, 66-year-old Dr. Paul R. Burkholder, professor emeritus of Columbia University, famed for his 20-year-old discovery of chloramphenicol. Diving with one or more assistants, Dr. Burkholder, who also teaches at the University of Puerto Rico, has been exploring principally the reefs around the Virgin Islands and Puerto Rico, mostly for corals, sponges, algae, and the bacteria that live in and on them. Whatever is brought up in the collecting sacks is within a few hours dried, frozen or suspended in a preserving liquid like ethanol and shipped to Lederle's Pearl River, New York laboratory for detailed analysis.

This involves obtaining crude extracts which are tested in a variety of ways for biological activity, including antibacterial properties, as well as potency against a wide range of diseases. Promising extracts are purified and separated into individual chemical components. The active components are then identified chemically by various methods, including x-ray crystallography, nuclear magnetic resonance, high resolution mass spectroscopy, etc., to determine accurately their structure for future testing and synthesis. A number of the samples they have received look "extremely promising," the doctors say, but competition in the drug

Marine Specimens that show promise as sources of new drugs:

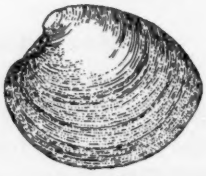


STONEFISH: secretes a potent poison found to reduce blood pressure in animals.



SEA CUCUMBER: an extract from it inhibits tumor growth in mice.

GREEN SPONGE: extracts have been found to have antibiotic capabilities.



QUAHOG:

and show anti-tumor activity.

SEA URCHIN:

CORALS: among organisms currently collected for testing.

industry being the fierce thing it is, they decline to identify them.

Needless to say, research of this sort is not quickly or inexpensively accomplished. The potential drug must be tested on animals to make sure its germ-killing properties outweigh any possible side effects. Finally, if it has not been abandoned by then, it is considered safe and effective enough to be tested on humans. It may take up to seven years between the time a company finds something it thinks is good and the marketing of it. And an application to the Food and Drug Administration to market a new drug can cost as much as seven million dollars, most of it going to develop the required information.

Talking about the program, Dr. Webb emphasized that Lederle is not planning the large-scale manufacture of drugs derived directly from marine organisms. To attempt to harvest the sea in that way would be impractical and wasteful. Instead, the company gathers small quantities of many materials, hoping to discover from them clues to new varieties of pharmacological substances that can be synthesized in the laboratory. This was the same approach that was used in producing many of the earlier drugs from land sources.

Expensive and complicated as this program is, Lederle, and presumably one or more other companies, feel it is worthwhile because the field of terrestrial plants, from which many drugs have been derived, has been pretty thoroughly picked over in the past 20 years. Marine organisms represent practically virgin territory. Also, Dr. Denton points out, the organisms they are interested in are those of relatively simple structure, which simplifies the task of determining their chemical make-up. "What we plan to do," he says, "is skim the surface and gather up the most easily used organisms. We're not planning to get any more involved than that. We hope that by the time a lot of other people get around to this kind of marine research we will already have been in and out of the sea."

Besides exploring the Caribbean, Lederle plans future underwater investigations of the Pacific, including the Philippine Islands and Australia's Great Barrier Reef. Of the thousands of marine organisms known to contain biotoxic substances, less than one per cent have been examined for biological activity. And of the one per cent studied, only about a dozen have been evaluated to a point where their chemical and pharmacological characteristics are known.

The finds that have been made to date are undoubtedly encouraging: extracts from the green sponge have shown antibiotic capabilities; an extract from a sea cucumber has inhibited the growth of malignant tumors in mice. A poison secreted by the stonefish has been able to reduce blood pressure in animals. Even the common quahog had produced an extract that shows strong anti-tumor activity.

So, if the next skin diver you see has a small mesh bag fastened to his wrist, the chances are he's not just a Sunday snorkeler but a scientist out for big game--the wonder drug of 1980.

(Reprinted from New England Marine Resources Information 11, April 1970.)

TEXAS MARINE RESEARCH STATION IS STEP TOWARD FARMING SEA

The Texas Parks and Wildlife Department has begun a research program "to find a way to increase and use the potential protein production in the sea to meet the increasing world demand for food." The research will be carried out at the Department's new Marine Fisheries Research Station near Palacios on Matagorda Bay. The station is designed to give biologists at least a partially controlled environment for research.

The Research Station

In 1967, the Department bought 40 acres near Well Point on Matagorda Bay because area had good-quality salt and fresh water, was above storm tides, had watertight soil, and utilities readily available. Construction began on a channel, a small-boat harbor, and 21 ponds one-quarter to 4 acres. A water system pumps salt water from the bay and fresh water from a well. The ponds can be drained completely by gravity flow.

Four ponds have dual water systems for circulating seawater; one pond is paved with asphalt to provide a hard surface for oyster culture.

Electrical outlets are available throughout pond area for aeration equipment and recording instruments. Filters can be installed on water lines to prevent introduction of unwanted organisms.

A 3,000-square-foot laboratory building has facilities for chemical and biological analysis, and a wet lab for holding and studying live specimens. Two residences and a storage building also have been built.

What Biologist Seek

The research station can be used for many kinds of studies. It is one of few installations in the world with facilities for adjusting the water's salt content.

The ponds are a large-enough controlled environment to simulate part of the bay. "By observing and analyzing the results of contained studies, biologists hope to learn more about bay populations and the effects of such factors as salinity, temperature, turbidity and water condition on fishery ecology, growth and production."

Present Research

Early research aimed at determining methods for holding fish and shellfish in a controlled and limited marine environment. Present research seeks to determine the importance of ecological factors that affect growth and survival of fish and shellfish; to evaluate mortality by fishing gear and fish tags; and to measure effects of various pollutants on fishery ecology.

Research also will consider the feasibility of cultivating bait shrimp for off-season sale, the artificial propagation and selective breeding of selected species, and development of methods to maintain organisms under conditions conducive to reproduction in artificial habitats.

Research at the station will supplement studies on marine species underway in other Texas estuaries. One such project is the development of a disease-resistant oyster to restore oyster beds devastated recently by a disease caused by a slime mold.

Biologists are seeking disease-resistant oysters to be cultivated in the ponds. They hope the seed for restocking will be obtained from these experiments.

Another basic research objective is to provide foundations for fish and shellfish cultures in manmade environments. There is considerable interest in the practicability of farming or raising shrimp, fish, and oysters in manmade ponds. Research could solve, or at least get around, biological and technical obstacles to profitable farming of fish and shellfish in artificial impoundments.

80,000 Brown Shrimp Stocked

In 1969, more than 80,000 baby brown shrimp were stocked in 9 ponds at rate of 20,000 per acre. These shrimp reached marketable size in 65 days when supplemental feed was applied, but the food conversion (pounds of feed needed to get one pound of shrimp) was poor.

Different rates of growth and survival resulted in ponds receiving same amount of food. This suggests that other factors affected the results. Oysters in the ponds grew rapidly. Survival was high when compared to oysters in Matagorda Bay.

1970 Research

In 1970, the effect of high and low salinity levels on growth of shrimp is being studied to provide basic data for freshwater requirements of Texas bays and estuaries. The researchers monitor closely the water chemistry and physical factors within each pond during experiments.

Researchers also are studying growth and survival of redfish, speckled trout, and southern flounder in other ponds.

Preliminary findings in the projects have been encouraging. Biologists are confident that resulting data can be applied to setting up a sound management program for some Texas marine resources. This information could provide foundation for raising seafood in man-made ponds.

BCF biologists periodically sample shrimp grown in $\frac{1}{16}$-acre ponds at Galveston, Texas.

CRAWFISH FARMING A TRICKY BUSINESS, SAYS TEXAS AGENCY

Crawfish farming is possible in Texas, advises the State's Parks and Wildlife Department. "But before you look up the recipe for etouffe, bisque or some other cajun culinary treat, consider the difficulties."

Crawfish, resistant to management, are vulnerable to fish and other predators. They spend much of their life in deep underwater burrows, and require for survival a fairly stable body of water with vegetation. They tend to be cannibalistic under some circumstances.

Pays off in Louisiana

Marion Toole, inland fisheries coordinator, says these and other problems have kept crawfish farming from getting much of a start in Texas. It has paid off in Louisiana, where it can be considered an industry. Much of the Louisiana catch is made from swampy areas and rice fields, rather than on "farms."

How to Do It

"To 'farm' the tasty crustaceans, a controlled water supply is needed--a lake that can be drained easily. The reservoir should be drained dry by March to eliminate all fish and other aquatic life from the basin. The pond should remain dry long enough for some vegetation to grow." The field should be flooded in May. The water supply should be stable enough to prevent a sudden water drop that could damage the crawfish.

If these crawfish were in the impoundment before draining, it might not be necessary to stock the reservoir. However, about 15 pounds per acre sometimes are helpful. After stocking, the water level should be maintained for about three weeks. Then it should be lowered slowly during the next weeks. This allows the female crawfish to burrow into the mud.

During the summer, the female lays eggs and attaches them to appendages on the underside of her tail.

The pond should be flooded during September to furnish growing space for the young. When the juvenile crawfish scatter and begin to grow, the prime considerations are availability of vegetation and oxygen in the water.

"With good management and a little luck," the Texas agency notes, "a good harvest will be the result in mid-winter, beginning around Christmas and continuing through February or March."

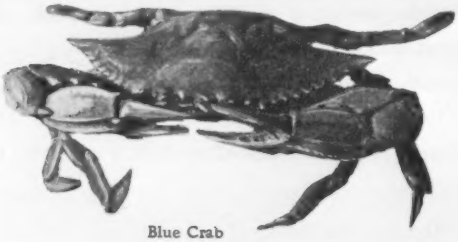
Start Small

New crawfish farmers are advised to start small. First determine if the crop will respond to the particular habitat established in the impoundments.

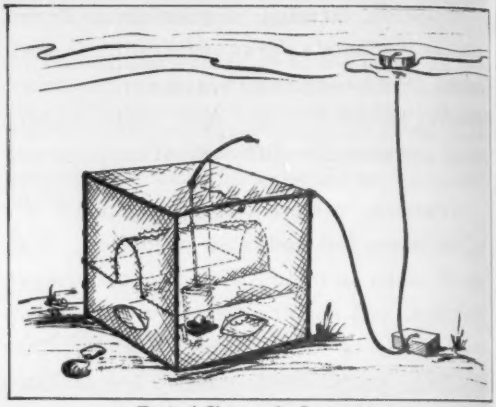
The crawfish can be harvested by seining, which is sometimes difficult, or by special baited traps. The farmer can trap the crustaceans himself, or adopt the Louisiana procedure of farming out the job to others on a fee or percentage basis.

1970 CHESAPEAKE BLUE CRAB CATCH PREDICTION IS LOWERED

The Chesapeake Bay catch of blue crab for the 12 months ending August 1970 is expected to fall short of the predicted 100 million pounds, reports W.A. Van Engel of the Virginia Institute of Marine Science (VIMS).



Blue Crab



Typical Chesapeake Bay crab pot.

The prediction of 100 million pounds was made in 1969 from estimates of young crabs. Crabs hatched in summer 1968 first appeared on Virginia and Maryland nursery grounds in October 1968. During 1969 they were found in greater numbers than ever before.

VIMS scientists believe that unusual weather during last summer and winter reduced blue crab stocks.

Unfavorable Weather

Crabs have been scarce in the rivers during routine winter and spring surveys. This confirmed fears that freshwater runoff in early August and after Hurricane Camille in late August 1969, and the cold winter, brought about salinity and temperature conditions that many crabs could not tolerate.

Crabs in the James and York rivers were hit hardest by Camille, so crab pot fishermen are likely to find fewer this summer in these rivers than in other years, including 1968 and 1969. Adult female crabs (sooks) will be very scarce. Most available crabs will be large and fat jimmies (males).

Less damage to crab stocks should have occurred in other Virginia rivers and farther up the bay, says Van Engel.

Problems Ahead

The market for crab meat appears good. Crab fishermen are anxious to work, but production of fresh crab meat has been slowed by scarcity of pickers in some houses.

The longer outlook contains more problems. Crab supplies in Virginia from September 1970 through August 1971 are expected to be lower than the previous 10-year average. Van Engel concludes that the 1969 hatch of crabs appears from present surveys to have been light. It is expected to produce a small crab catch: similar to the below-average landings of 1968 and the first two-thirds of 1969.

o o ● o o

ANNUAL RIVER HERRING CATCH BY FOREIGN FLEETS ESTIMATED

Jackson Davis

For the third year, the USSR and Poland have sent fleets of more than 100 trawlers to fish for mackerel and herring off the Mid-Atlantic coast from Cape Hatteras, North Carolina, to Ocean City, Maryland. From information obtained on Coast Guard surveillance flights, in cooperation with the Bureau of Commercial Fisheries (BCF), it has been determined that the number of Soviet vessels has fluctuated between 10 to 110 trawlers, and the size of the Polish fleet has averaged about 10 trawlers during 1970. In 1969, the combined fleet numbered about 150 vessels; in 1968, about 100. Prior to 1968, the foreign fleet fished north of Maryland, for the most part, and only 10 to 30 vessels worked off the Virginia Capes.

Virginia finfishermen have expressed concern about the effects of these harvesting activities on the success of their own fishing operations.

A Visit to Fleet

Under BCF auspices, a 9-man party of Americans, including the author, boarded a Soviet factory ship off the Virginia Capes to talk with the fleet commander, V.A. Zakharov, and his deputies. The commander indicated that the average daily catch of his SRT-class vessels (145-foot side trawlers) was 2 tons of mackerel and 2 tons of herring--a total of 4 tons per vessel per day. He did not state the average daily catch of the larger side trawlers and stern trawlers.

About 30% of the herring catch was sea herring (Clupea harengus), also called Labrador herring, and the remaining 70% (2800 pounds per vessel per day) was river herring.

1970 Catch Estimate

If the average daily catch is multiplied by the number of vessels reported operating, an estimate of the smallest probable catch is obtained. Thus, the 1970 catch of river herring by the Soviet fleet probably is not less than 12 million pounds; that of the smaller Polish fleet probably not less than 3 million pounds. Because we do not know the catch-rate of the larger vessels, we are unable to calculate a more accurate estimate at this time. However, our observations of the foreign fleet at sea lead us to guess that their catch of river herring does not exceed 30 million pounds.

Where Caught

These 15 to 30 million pounds were caught south of 38° 30' N latitude (Ocean City, Maryland) and, therefore, represent fish that might have spawned in tributaries of Chesapeake Bay and in other streams up the coast. To put the oceanic harvest by foreign fleets in perspective, one should realize that the annual landings of river herring in Virginia have averaged around 30 million pounds in the last few years.

The Virginia Institute of Marine Science has been collecting data on the ages and spawning history of river herring in the James, York, Rappahannock, and Potomac rivers since 1965. This information is now being interpreted to determine the influence of the foreign fishery on herring stocks. Results will be announced in future issues of the Bulletin.

Dr. Davis is Head, Ichthyology Dept., Virginia Institute of Marine Science (VIMS). Article appeared in 'Bulletin,' May 15, 1970.

FOREIGN FISHING OFF U.S. IN APRIL 1970

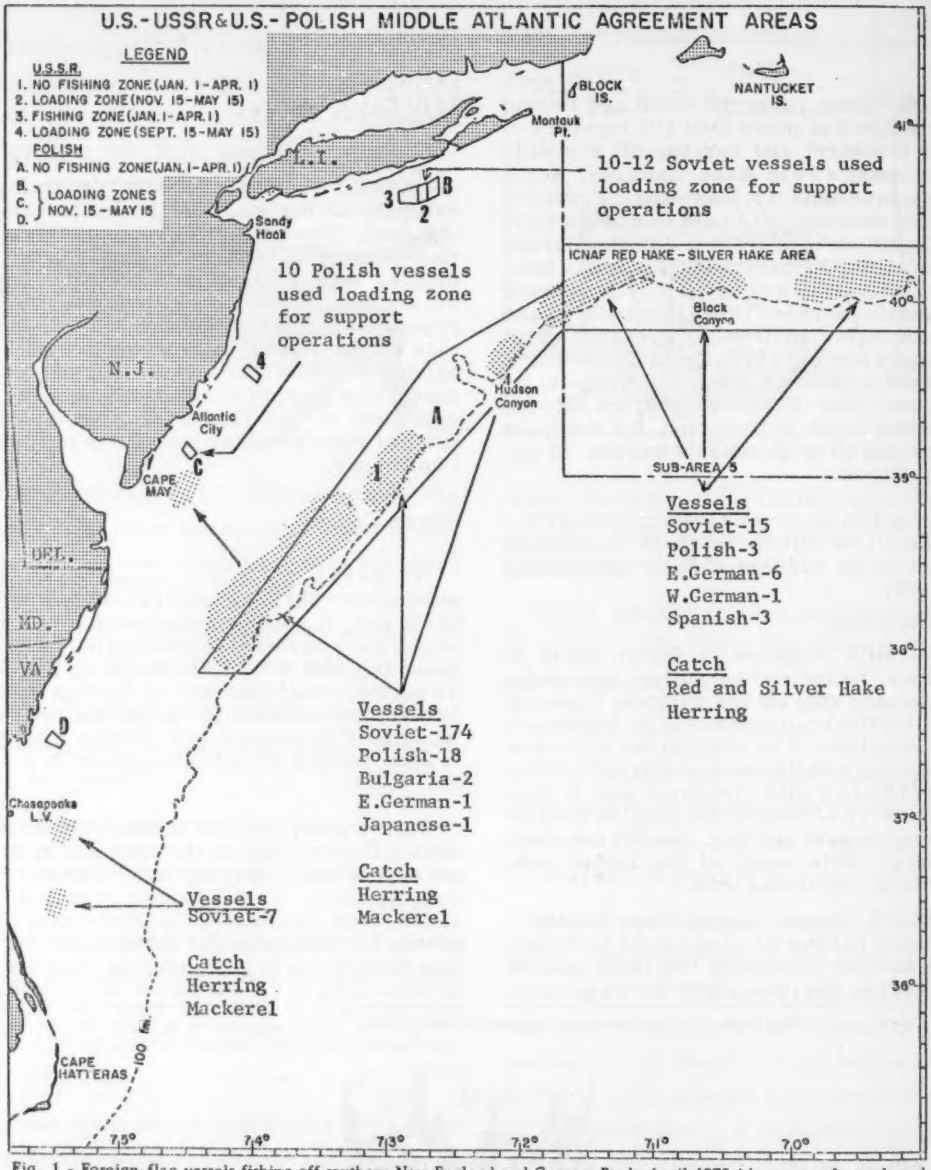


Fig. 1 - Foreign-flag vessels fishing off southern New England and Georges Bank, April 1970 (shows no. of vessels and species fished).

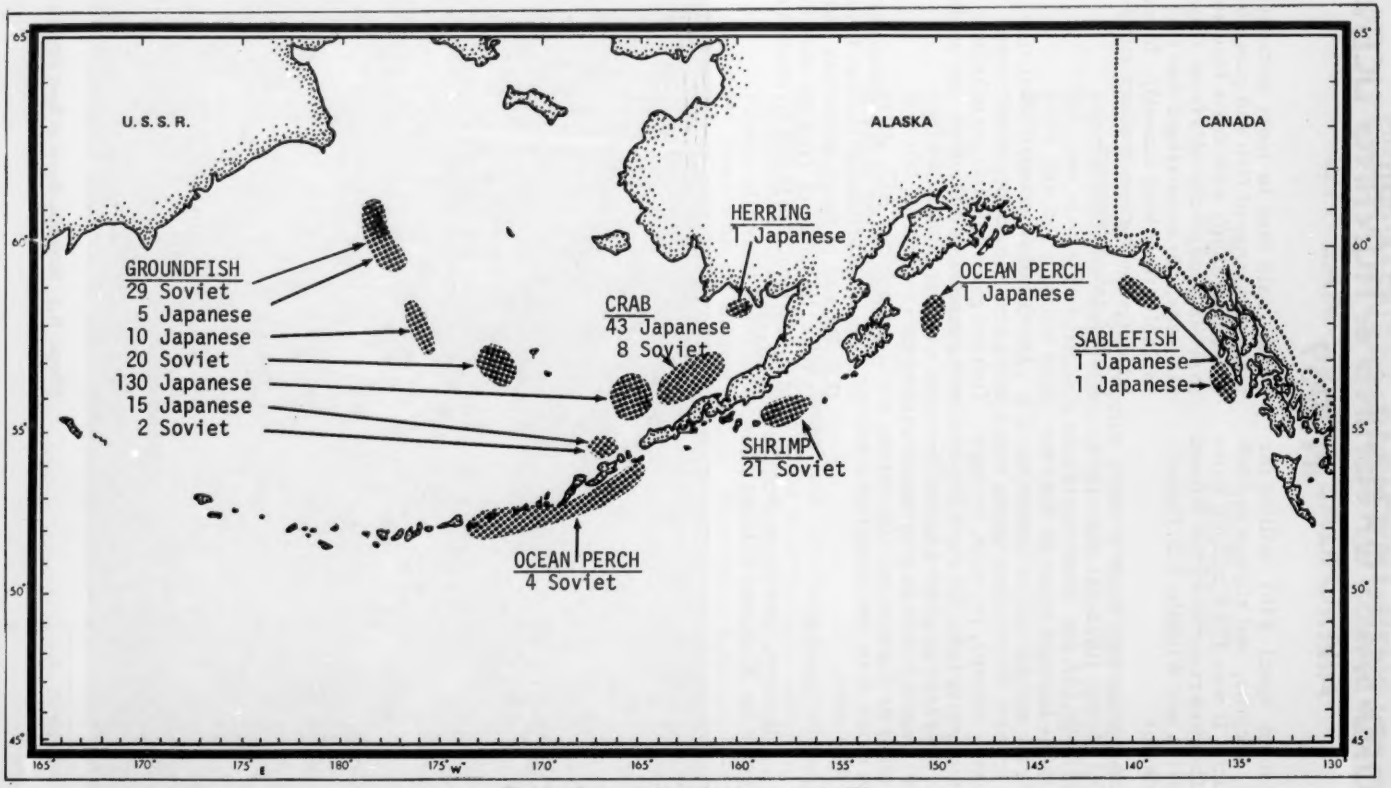


Fig. 2 - Foreign fishing off Alaska, April 1970.

RECORD SALES OF FISHING & HUNTING LICENSES IN 1969

U.S. sportsmen spent $183 million for licenses, tags, permits, and stamps in 1969 to fish and hunt. It was $14.5 million more than in 1968. This was reported by the Bureau of Sport Fisheries and Wildlife, U.S. Department of the Interior.

In 1969, fishing-license holders were a record 24,076,148--up 1,015,851 over 1968. They spent $87,500,774 for licenses--$7.5 million above 1968. License sales do not reflect accurately the number of fishermen because: (1) in several States, sportsmen buy separate licenses, stamps, permits, or tags for different species of fish; (2) most States do not require several age groups to buy licenses; (3) most coastal States do not require licenses for saltwater fishing; and (4) some persons fish in more than one State and are counted more than once.

Controlled Harvest Essential

Dr. Leslie L. Glasgow, Assistant Secretary of the Interior for Fish and Wildlife and Parks, said that in most instances the controlled harvest of fish and game is essential to balance them with their food supply--and to prevent major die-offs from starvation and diseases. He emphasized that fish and game replenish their kind annually. In many years, many fish and game produce surpluses their habitat cannot support.

Dr. Glasgow noted: "Controlled harvests are a sensible and practical means of keeping fish and game populations in balance with their environment so that they can continue to be healthy and productive."

State fish and game departments certify the number of paid fishing-license holders to the U.S. Bureau of Sport Fisheries and Wildlife. In turn, the Bureau uses the data in distributing Federal Aid in Restoration funds to the 50 States.

(Photo: W.F. Kubichek, Bureau of Sport Fisheries & Wildlife)

EXPERIMENTAL SABLEFISH FISHING OFF SAN DIEGO, CALIFORNIA

Charles F. Phleger
Nils Schultz
Andrew Soutar
Erich Duffrin

We feel that our results showing such high sablefish populations in the deep waters off this area are well worthy of the commercial fisherman's attention. Much interest in this work has been shown here, not only by oceanographers at Scripps and at the Bureau of Commercial Fisheries, but by a number of commercial fishermen on the coast.

We have found free-vehicle gear to be remarkably successful in fishing these deep bottom fish. We feel that commercial fishermen everywhere should be aware of its usefulness. The technique allows great flexibility. It can be used to catch deep-water fish anywhere in the world.

Free-vehicle fishing techniques have been modified and tested successfully in a survey of the benthopelagic sablefish, Anoplopoma fimbria, off San Diego and the offshore islands. Plastic elliptical traps have been placed in series on vertical set lines with or without hooks. Short-term releases (3-4 hours) can be as effective as longer-term releases (8-14 hours) in areas with high populations of fish. Sablefish numbers were extensive in almost all areas monitored between depths of 250 and 500 fathoms; maximum yields were obtained at 500 fathoms. The average hookline yield from all stations was 0.24 fish per hook (range: 0.00-0.75 fish per hook); the average trap yield from all stations was 4.4 fish per trap (range: 0-12 fish per trap).

Our results provide evidence that sablefish populations are extensive off San Diego and the offshore islands. These fish represent an underfished resource in this area. We feel that they can be fished economically through some form of free-vehicle technique.

The sablefish (or black cod, seatrout, skilfish, beshow, coalfish, butterfish, candlefish), Anoplopoma fimbria, has been fished commercially by civilized man on the western coast of North America since the middle of the nineteenth century (Pacific Marine Fisheries Commission, 1954). The fishery, extending from Southern California (Newport Beach) to Alaska, has mostly been a secondary product of the Pacific coast halibut fishery, along with ling cod (Ophiodon elongatus) and red cod (Sebastodes ruberrimus). It is of special importance during the winter closed season for halibut (Thompson, 1941). It is fished by longline gear and otter or balloon trawls (Phillips, 1958).

The sablefish market is mostly for fish in the smoked or kippered form. The market for fresh fish is limited because the flesh is quite oily. According to Dolev and Olcutt (1965), sablefish oil is highly stable (no detectable rancidity at 50° C. over five months). The triglycerides are characterized by less polyunsaturated fatty acids than most marine

The authors are associated with the Scripps Institution of Oceanography, La Jolla, Calif. 92037, University of California, San Diego.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Reprint No. 874

oils. Smaller sablefish often are filleted and sold fresh; larger ones are frozen and smoked. As early as 1910, the smoked form of these fish was marketed as barbecued Alaska black cod, a very popular restaurant item. Sablefish was the most important smoked fish product prepared in California in the 1930s; all of it was produced in San Francisco (Croker, 1936). The salted product was especially useful in the sale of beer in saloons.

Collected In 100-800 Fathoms

Sablefish are most commonly collected by Scripps Institution of Oceanography ichthyologists off San Diego between depths of 100 and 800 fathoms. They are a common benthopelagic fish in this area (Marine Vertebrate Cruise Data, Scripps Institution of Oceanography). They have been photographed as deep as 656 fathoms by the Marine Life Research Group at Scripps (Walter Schmidt, personal communication) on the San Clemente rift slope. Phillips (1958) gives 200-400 fathoms as the depth range during winter and early spring spawning season. After spawning, the fish are found in shallower depths, about 100-175 fathoms. The most extensive surface run of these deep-dwelling fish occurred in the region of the municipal pier in Monterey, California, where fishermen landed about 110 tons from the pier during 15 days (Cox, 1948). Sablefish eggs are pelagic and free floating and have been collected near the surface (Clemens and Wilby, 1946). The larvae and young are also collected near the surface as well as farther out to sea than is expected from the adult distribution. Brock (1940) describes morphological differences between the young and adults. He speculates that the large pectoral fins in the young (about one-third the body length) might aid in flotation. They reduce to one-tenth the body length in the adult.

Extensive intermingling of sablefish stock off North America does not occur (Pacific Marine Fisheries Commission, 1954). Tagging data demonstrate that most fish do not migrate more than 30 miles from the point of release. There are at least four major stocks on the Pacific coast which do not intermingle to any significant extent.

Sablefish Trawl Landings

According to Orcutt (1969), annual sablefish trawl landings in California of recent years have averaged slightly more than 2,000,000 lbs. Total California landings of sablefish between 1963 and 1967, and the mean price per lb. during these years, are shown in Table 1. Orcutt states that this resource could stand harvest of at least four to five million pounds more each year. Interestingly enough, the fishery has never extended to San Diego; reports often give the southern limit as north of San Diego. Generally, it is thought to extend from northern Baja California to the Bering Sea, with a greater concentration in the northern part of the range. The fish are not abundant south of Monterey, California (Phillips, 1958).

Table 1 - Sablefish landings and shipments, 1963-1967, landings in lbs. round weight. (From California Department of Fish and Game, Bulls. Nos. 129, 132, 135, 138, 144.)

Eureka	637,937	1,136,677	1,554,968	1,588,892	2,300,577
San Francisco	840,564	826,330	683,292	1,031,522	474,786
Monterey	271,226	410,717	570,905	593,831	1,021,201
Santa Barbara	57,436	88,215	53,140	1,658	1,610
Los Angeles	348	926	1,245	16	-0-
San Diego	1,838	587	-0-	20	-0-
Total	1,809,349	2,463,452	2,863,550	3,215,939	3,798,493
Mean Price Per lb.	.054	.066	.070	.072	.083

METHODS AND MATERIALS

The free-vehicle fishing technique that we have used in this study is illustrated in Fig. 1. The term free-vehicle means that the fishing gear is completely released from the fishing vessel, whereupon it sinks and rests upon the bottom to attract fish for a variable length of time. After this time, a release mechanism breaks the connection between the fishing assembly and weights, and the gear floats back to the surface leaving the weights on the bottom. It may be located by a number of techniques, including radios, radar screens, bright flags, and blinking lights.

Launching is best accomplished by trailing the gear out behind the boat, which moves

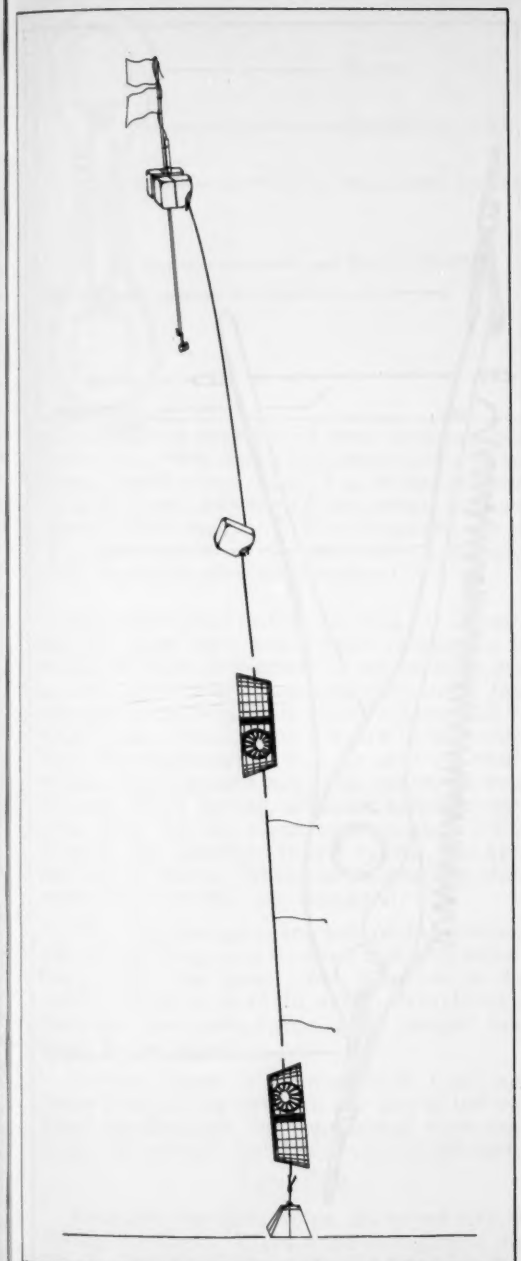


Fig. 1 - Free vehicle fishing gear; schematic diagram. Top shows plastic mast supported by isopar-filled jerry jugs with radio and flags. Fifty feet of handling line connects to secondary float, below which are traps and setline. Free vehicle is held on the bottom by a 60 lb. weight. The release is located between the lower trap and weight.

ahead at a slow speed. Floats and mast are placed in the water first, after which the secondary float, hookline and/or traps are paid out. Finally, the release device and weights are dropped in, and the whole assembly then sinks to the bottom.

The mast assembly includes a mast, bright flags, stabilizing weight, floats, and radio plus antenna. The mast itself consists of a 12-foot length of plastic pipe, one inch in diameter. We have found that plastic is much less subject to breakage than wood, and it is less expensive than hollow metal tubes that have been used. The flags, usually bright yellow or international orange, are attached near the top of the mast. The stabilizing weight, 4 pounds of lead, is attached at the bottom of the mast to help keep it upright while floating at the surface. Two floats are clamped to the mast at its center point. Further stabilization of the mast assembly is achieved by clamping the floats tightly. This aids in equipment recovery since the mast stands erect in the water. Previous experience with loosely attached floats caused problems, despite the pressure of a stabilizing weight, because the mast would not be upright in the water. In strong winds and heavy seas, mast assemblies would lie almost horizontal in the water, making visual sighting nearly impossible.

The Float

A float consists of a plastic 5-gallon carboy container filled with a lightweight oil. Isopar-M, a vehicle oil manufactured by Humble Oil and Refining Co., has been used successfully. A single 5-gallon container provides 11 lbs. of buoyancy at the surface. It is an odorless, relatively high boiling (172° F.), isoparaffinic solvent, with unusually low skin-irritation effects. Spillage on clothes leaves no stain mark. Compressibility data (tabulated at 32° F.) show a decrease in volume of 1.2% at 2,000 p.s.i. and 5.5% at 10,000 p.s.i. Cost is $0.23 per gallon from a tank car, and $0.62 per gallon if ordered in a 55-gallon drum. We feel that Isopar-M is preferable to gasoline as a float material because fammability is reduced. If gasoline is used, occasional leaks in floats while operating in rough seas can be very hazardous.

The return of the free vehicle to the surface is signaled by a one-watt radio transmitter. This radio operating at citizen band frequencies (27 mega-hertz) is able to transmit its signal up to 10 miles. Since the radio

is coupled to a pressure-activated switch, battery power is conserved, and the radio may operate for a day or longer. The free vehicle is located with a radio direction finder (RDF). Standard RDF units are not able to sense a direction because of their power and frequency. A high-sensitivity portable unit, or a large directional citizens band antenna, must be used.

A handling line (50 ft. long) is attached to the two floats, with a third float attached to the other end. This expedites hauling the mast assembly aboard before the fishing gear is encountered. The vertical set line is situated below the third float. This can consist of 30-60 hooks (8-0 or 9-0) spaced about 1- or 2-meter intervals on plastic leaders (a foot or 2 long), a hookline with a trap above and below hooks (see fig. 1), or a string of traps in series. We have used successfully 8 traps spaced at intervals of 8-10 feet.

Elliptical Traps

Elliptical traps have proved excellent for catching fish and bottom creatures. These traps are manufactured by Fathoms Plus, a San Diego company, and have the following advantages over traditional metal lobster traps: (1) they are made of black plastic and so are impervious to water, rust, electrolysis, rot, and marine borers; (2) they can be rested in stable stacks to conserve space aboard boat; and (3) as organisms sense the bait, they constantly move closer to it from any direction. The trap is made from high-density polyethylene and measures 40" by 3" by 14". The bait containers (12" by 4.5") can be removed from traps and stored separately.

A release mechanism is located between bottom hook or trap and weights. We have used 2 types of releases made of magnesium: wire-plier and magnesium-rod.

The wire-plier type is excellent for short-term sets (3 to 5 hours). The pliers are suspended from set line (fig. 2), and a short piece of $\frac{1}{16}$" magnesium wire is clamped between the two handles. This keeps pliers shut, so the weights can be suspended from other end. When the wire dissolves, the pliers spring open--releasing the weights on the bottom. A spring insures that the pliers will open. The pliers are recovered and must be acid soaked or sanded after immersion to clean the metal surface; this acts as an electron acceptor.

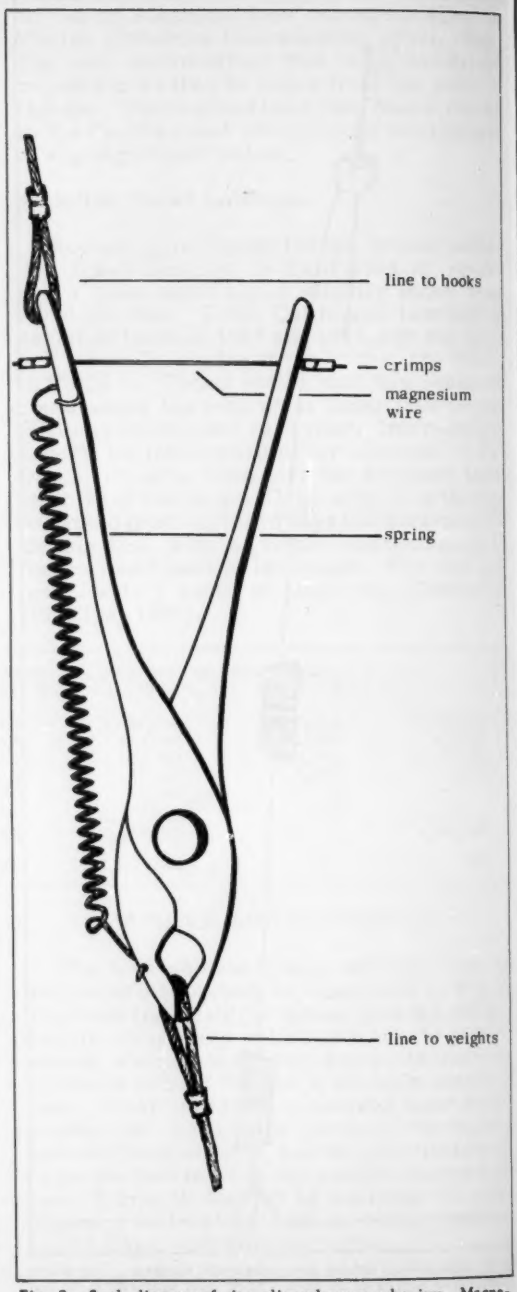


Fig. 2 - Scale diagram of wire-plier release mechanism. Magnesium wire is $\frac{1}{16}$ inch diameter. When it dissolves in seawater, the spring insures that the pliers will snap open to release the weights.

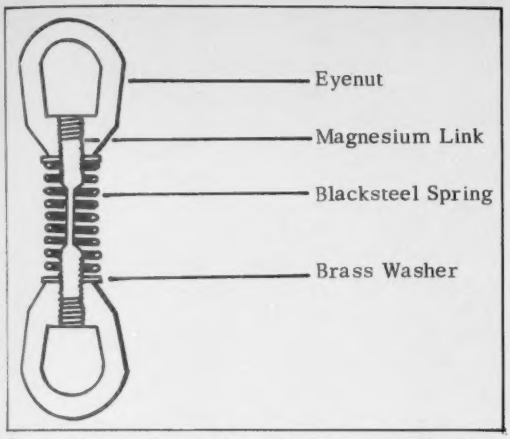


Fig. 3 - Diagram of magnesium rod release mechianism (from Schick, et al., 1968). Setline is attached to upper eyenut and weights attached to lower eyenut. A no. 68 black finish steel spring $1\frac{3}{4}$" length) is used with two $\frac{3}{8}$" brass washers. Galvanized eyenuts (or black steel) with $\frac{3}{8}$" thread diameter are used. A $\frac{3}{8}$" diameter magnesium rod alloy AZ31B is used. Length of rod is $2\frac{1}{2}$" and length of narrow center portion is 1".

The magnesium rod or link (fig. 3) is useful, but these are more time consuming to construct than wire-plier. A magnesium rod is turned on a lathe to desired diameter. Rod strength considerations usually limit this to 0.125 inch, which takes 8 hours to dissolve. Thus, this technique cannot be used for short terms. Two eyenuts are attached to the rod. A black steel spring, situated between eyenuts, acts as an electron acceptor. The weights are attached to one eyenut, the setline to the other. When the magnesium dissolves, the weights are released.

Since the weights are left on the bottom, almost anything can be used that will effectively sink the gear. We often use 80-lb. concrete blocks, or 40-lb. scrap metal blocks. However, concrete loses more weight than metal in the water.

Current laws of California's Fish and Game Code do not prohibit the use of the release mechanism in conjunction with setlines. However, fish traps are prohibited.

RESULTS

Fourteen stations were surveyed (fig. 4) during this study. Eight were in region of San Diego, extending from north of La Jolla to Los Coronados Islands. Stations 9-11 were east of San Clemente Island; station 12 south of Santa Catalina Island; station 13 on San Juan seamount, about 200 miles west of San Diego; and station 14 was one-half mile east of north end of Guadalupe Island, Mexico. Three free vehicles were lowered at each station with varying amounts of hooks, traps, and bottom times. The depths surveyed ranged from 290 to 500 fathoms. Excepting San Juan seamount and Guadalupe Island, the only fish caught at all stations were sablefish.

Stations 1-4 were at 350 fathoms; no traps were used. The vertical set-lines (30 hooks per line) yielded more fish per hook the farther south the station was. The northernmost station (1) yielded 0.03 fish per hook; the southernmost station (4) 0.26 fish per hook (Table 2). The average weight also increased from north to south--from 2.5 lbs. to 4.4 lbs.--as did average standard length, 478 mm. to 600 mm.

Table 2 - Vertical set line results from stations 1-4. These stations extend from 32°59' NL to 32°49' NL along the 350 fathoms contour line.

Stations:	1	2	3	4
Sablefish Per Hook:	0.03	0.00	0.10	0.26
Average Weight:	2.5 lbs.	0.00	2.6	4.4
Average Length:	478 mm.	0	523	600

Stations 5 and 6, at 32° 42' NL off Point Loma, San Diego, were at 290 and 340 fathoms, respectively. Vertical set lines with a trap between hookline and release were used. The results show a greater yield of fish per hook and per trap at 340 fathoms (Table 3). At 290 fathoms, the average number of sablefish per hook was 0.10; at 340 fathoms, 0.37 fish per hook. Trap yields increased from 1.7 to 2.2 fish per trap. Although weight of fish on

Table 3 - Results from stations 5 and 6; both situated at 32°42' NL off Point Loma, San Diego.

	Station 5 (290 fathoms)		Station 6 (340 fathoms)	
	Vertical Set Lines	Traps	Vertical Set Lines	Traps
Sablefish Per Hook:	0.10		0.37	
Sablefish Per Trap:		1.7		2.2
Average Weight:	3.75 lbs.	4.3 lbs.	4.5 lbs.	4.2 lbs.
Average Length:	489 mm.	537 mm.	539 mm.	538 mm.

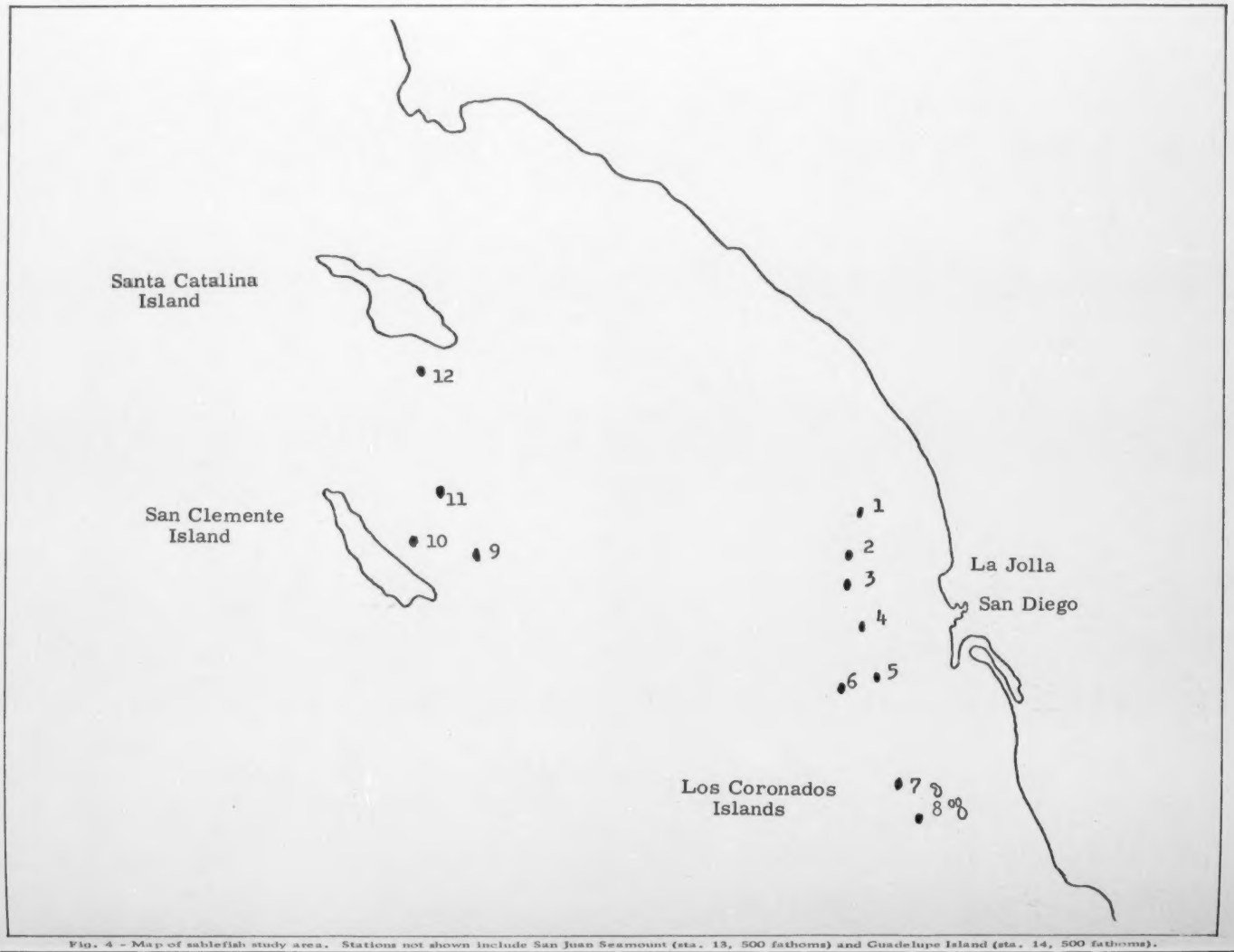


Fig. 4 - Map of sablefish study area. Stations not shown include San Juan Seamount (sta. 13, 500 fathoms) and Guadelupe Island (sta. 14, 500 fathoms).

hookli
avera
fish w

Sta
contou
These
times
in ser
vertic
also te
The y
consi
1-6. A
0.75 fi
yielde
7, the
per ho
hookli
standa

Table
Islan
in s

Releas
Time

Sablefi
Per Hoo

Sablefi
Per Tra

Averag
Weight

Averag
Length

Table

Releas
Time

Sablefi
Per Hoo

Sablefi
Per Tra

Averag
Weight

Averag
Length

hooklines was greater at 340 fathoms by an average of 0.25 lb., average weight of trapped fish was about the same, 4.3 lbs. and 4.2 lbs.

Stations 7 and 8 were on the 500 fathoms contour line, west of Los Coronados Islands. These stations were surveyed using release times of 3, 8, and 14 hours on hooklines. A vertical set consisting only of 8 traps spaced in series on the line at 10-foot intervals was also tested on a 14-hour release at station 8. The yields of sablefish at these stations were considerably higher than results at stations 1-6. At station 8, the 14-hour release yielded 0.75 fish per hook, whereas the 8-hour release yielded 0.44 fish per hook (Table 4). At station 7, the 3-hour wire-plier release gave 0.67 fish per hook. Average weights of fish caught on hooklines ranged from 4.4-4.8 lbs., average standard lengths from 531 mm. to 559 mm.

Table 4 - Results from two stations west of the Los Coronados Islands, situated at 500 fathoms. At station 7, eight traps in series were used on a line rather than usual set-line plus combination.

	Station 7	Station 8		
	Vertical Set Lines	Vertical Set Lines	Vertical Set Lines	Traps (8)
Release Time:	3 hrs.	8 hrs.	14 hrs.	14 hrs.
Sablefish Per Hook:	0.67	0.44	0.75	
Sablefish Per Trap:				5.3
Average Weight:	4.8 lbs.	4.8	4.4	5.4
Average Length:	538 mm.	559	531	586

Fish in the traps had a larger average weight, 5.4 lbs., and average standard length, 586 mm. The average number of fish per trap was 5.3. The distribution of fish in the traps from bottom trap (No. 1) to top trap (No. 8) was: No. 1, 7 fish; No. 2, 11 fish; No. 3, 3 fish; No. 4, 3 fish; No. 5, 6 fish; No. 6, 5 fish; No. 7, 3 fish; No. 8, 4 fish. Although fish entered all traps, the greatest yields were in bottom two traps.

Stations 9, 10, and 11 were located east of San Clemente Island at 500 fathoms. These stations were surveyed using 8-, 3-, 3-hour releases, respectively. At the two short-term stations (10 and 11), one trap was between set-line and release. No traps were used on the set lines at station 9, but a string of 8 traps in series was used. At station 9, with 8-hour release, the set-lines yielded 0.64 fish per hook; average weight was 4.8 lbs. and average standard length 537 mm. (Table 5). The set-line yields at stations 10 and 11 with 3-hour releases were 0.13 and 0.07, respectively. The weights and standard lengths were similar to station 9. The bottom traps at stations 10 and 11 proved quite effective, in contrast with low hook line yields, with average of 8 and 5 fish per trap. The 8-trap series at station 9 averaged 3.1 fish per trap. The distribution of fish in traps from bottom (No. 1) to top (No. 8) was: No. 1, 4 fish; No. 2, 8 fish; No. 3, 3 fish; No. 4, 3 fish; No. 5, 4 fish; No. 6, 3 fish; No. 7, 1 fish; No. 8, 1 fish. More fish were caught in lower traps than in higher traps. In contrast to results at Los Coronados Islands, fish in traps did not have greater weight or length. Sixty of the sablefish caught on hooks or in traps were chosen at random for sexing: 19 were males, and 41 females (8 gravid).

Table 5 - Results from 3 stations located east of San Clemente Island at 500 fathoms. At stations 10 and 11, vertical set lines plus one bottom trap were used. At Station 9, an 8-trap combination was used in addition to vertical set lines.

	Station 9		Station 10		Station 11	
	Vertical Set Lines	Traps (8)	Vertical Set Lines	Traps (1)	Vertical Set Lines	Traps (1)
Release Time:	8 hrs.		3 hrs.		3 hrs.	
Sablefish Per Hook:	0.64		0.13		0.07	
Sablefish Per Trap:		3.1		8		5
Average Weight:	4.8 lbs.	4.5 lbs.	5.5 lbs.	4.5 lbs.	4.3 lbs.	4.5
Average Length:	537 mm.	535 mm.	565 mm.	537 mm.	514 mm.	530 mm.

Fig. 4 - Map of sablefish study area. Stations not shown include San Juan Seamount (sta., 13, 500 fathoms) and Guadalupe Island (sta., 14, 500 fathoms).

Two vertical set-lines with 30 hooks--and one trapline with 3 traps spaced 5, 35, and 65 feet from the bottom on the line--were used at station 12, located at 500 fathoms south of Santa Catalina Island. The trap yield (5.7 fish per trap, Table 6) contrasted markedly with set-line yield (0.03 fish per hook). As usual, fewer fish were trapped at top of trap line. Four fish were trapped in lowest trap, 12 in middle trap, and one fish in top trap. At San Juan seamount, a single setline trap combination was used on a 3-hour release, where the trap was between hookline and release mechanism. Only one sablefish was caught on the set-line, while 2 were caught in traps (Table 6). Twelve Pacific rattails (Coryphaenoides acrolepis) were caught on hooks at this station. They were spread evenly between bottom and top hooks. The Guadalupe Island station, sampled at 500 fathoms, yielded one Pacific rattail on a hookline, and no sablefish.

Table 6 - Results from station 12, south of Santa Catalina Island at 500 fathoms, and station 13, on San Juan seamount at 500 fathoms.

	Santa Catalina Island		San Juan Seamount	
	Vertical Set Lines	Traps (3)	Vertical Set Lines	Trap (1)
Release Time:	8 hrs.	8 hrs.	3 hrs.	3 hrs.
Sablefish Per Hook:	0.03		0.03	
Sablefish Per Trap:		5.7		2.0
Average Weight:	4.5 lbs.	4.4 lbs.	9.0 lbs.	13.0
Average Length	529 mm.	535 mm.	652 mm.	728 mm.

DISCUSSION

A considerable sablefish population exists off San Diego and the offshore islands. It is interesting that only sablefish were caught at depths examined in this study, 290-500 fathoms. No other fish were encountered on the gear used; the exception was Pacific rattails at San Juan seamount and Guadalupe Island, which do not qualify as being anywhere near San Diego. The average yield on all hooklines lowered at stations 1-12 was 0.24 fish per hook. This figure is calculated without consideration of time on bottom, depth of capture, or geographical location. Maximum hook yields were obtained at stations 6-9 (0.37 to 0.75 fish per hook), located at 350 fathoms off Point Loma, San Diego, and at 500 fathoms off Los Coronados and San Clemente Islands. The average trap yield from all stations where traps were tested (stations 5, 6, and 8-12) was 4.4 fish per trap. This figure is calculated without respect to release time, position of traps on line, depth of capture, or geographical location. Maximum trap yields (5-8 fish per trap) were obtained at station 8 and 10-12. The majority of high trap yields did not occur at stations where high hook yields occurred.

Small Fish

Sablefish caught in this study were small fish by comparison with northern populations. The Seattle, Washington, sablefish fishery defines a small fish as average weight of 6.5 lbs., and large fish as average weight of 12 lbs. Average weights of the San Diego sablefish usually were 4 to 5 lbs. At stations 4-12, average weights were 3.75 to 5.5 lbs. from both hooklines and traps. At stations 1-3, the yields were too low (0.03 and 0.10) to attach any significance to smaller average weights (2.5 and 2.6 lbs.). From a marketing standpoint, the fact that these fish are small might be an advantage because small fish can be sold fresh as well as smoked. Large fish usually are sold only in smoked form.

Depth Important

Depth is probably a very important factor to consider in choosing the best area to fish for sablefish. Philipps (1958) gave the depth range as 200-400 fathoms, when the fish are not spawning, but this is for the northern fishery. We fished between 290 and 500 fathoms and found a maximum yield at 500 fathoms. Data collected off La Jolla and San Diego (Tables 2 and 3) show relatively low yields for 290-350 fathoms (0.00-0.37 fish per hook). The yield increases off San Diego from 290 fathoms (0.10 fish per hook and 1.7 fish per trap) to 340 fathoms (0.37 fish per hook and 2.2 fish per trap). The highest yields were obtained off Los Coronados Islands and San Clemente Island at 500 fathoms (0.64-0.75 fish per hook). These fish must congregate in deeper water the farther south they are found. We fished no deeper than 500 fathoms. Perhaps considerable aggregations will also be common at depths greater than 500 fathoms.

The release time can be varied considerably in free-vehicle fishing. This can be done to suit the fishermen's schedule, or it can be done to maximize yield as a function of time.

Our data from stations 7 and 8 (Table 4) serve to illustrate the latter point. At station 8, the yield was almost doubled with a 14-hour release (0.75 fish per hook) versus an 8-hour release (0.44 fish per hook). At station 7, however, an extremely high fish yield (0.67 fish per hook) was obtained in 3 hours. Three-hour release times did not give such high yields at stations 10 and 11, perhaps due to a more sparsely distributed fish population.

Although we only used 3-14 hour release times, there exist new devices that are quite accurate from 30 minutes to 30 days. An endless amount of flexibility is thus possible to the fisherman with an already tight schedule.

Elliptical Traps

The elliptical traps were built specifically to catch lobsters on the bottom. The fact that they successfully catch sablefish above the bottom proves they also work well as fish traps. At some stations, the traps functioned much better than the hooks. For instance, at station 12, off Santa Catalina Island, the hook yield was 0.03 fish per hook, whereas 3 traps spaced in series at the same station yielded 5.7 fish per trap. Twelve sablefish were caught in middle trap (35 feet off bottom), with an average weight of 4.4 lbs.--revealing the potential of free-vehicle trap fishing.

Traps have additional advantages. They provide a cage to protect the fish from predators. The blue shark (Prionace glanca) often fouls up hooklines at the surface, but it cannot eat fish in the traps. Sealions also enjoy eating sablefish off the hooklines. Traps might be best for especially long release times (greater than one day) because fish seem to live longer in the traps than on the hooks. More living fish are present in the traps than on the hooklines when hauled aboard the ship. For long bottom times, an automatic bait delivery device can be built to provide a continual fish lure, perhaps used together with blinking underwater lights. Large traps (25' by 25' by 25', or bigger) can be constructed of plastic and left on the bottom for a week or more--or these can be timed to return to surface whenever fisherman is conveniently in area.

Free-Vehicle Fishing

Free-vehicle fishing can be profitable. Hookline and trapline data obtained in this study may be extrapolated to illustrate. At station 7, for instance, 0.67 fish per hook was obtained on a 3-hour release. If two men in a 20-foot skiff were equipped with 8 free vehicles, 60 hooks per line, they would haul in considerable sablefish at this station during an 8-hour work day. It takes 15-20 minutes to pay out a setline, so the lines would start popping up shortly after the men had finished paying them out. At an average of 4.8 lbs. per fish at this station, 16 sets might yield 3,100 lbs. of fish. Before leaving, the 2 men could put down 8 sets on 14-hour releases with 8 traps on each set. At station 8, we obtained 5.3 fish per trap with average weight of 5.4 lbs. These could be retrieved in the morning, yielding 1,800 lbs. of fish. This fishing rate would result in a maximum return of 2,500 lbs. of fish per man per day. Using the prices given in Table 1, the return would be between $125 to $200 per man per day.

Best marketing of sablefish probably can be obtained by smoking these fish. We have tested palatability of smoked San Diego sablefish and found great enthusiasm for the product. Many people consider it superior to smoked salmon. Sample platters of this delicacy disappeared rapidly in local saloons.

Acknowledgments

We thank the Foundation for Ocean Research and the Marine Life Research Group for supporting this study. Acknowledgment is extended to Dr. Andrew A. Benson and Dr. John D. Isaacs, who kindly provided advice, support, and ship time. Mr. Roger E. Green reviewed the manuscript critically and suggested inclusion of the information in Table 1.

LITERATURE CITED

BROCK, VERNON E.
1940. Note on the Young of the Sablefish, Anoplopoma fimbria, Copeia, (4): 268-270.

CLEMENS, W.A. and G. V. WILBY
1946. Fishes of the Pacific Coast of Canada, Canada Fish. Res. Board Bull., (68): 239-240.

COX, KEITH W.
1948. Sablefish Run at Monterey Bay, Calif. Fish and Game, 34 (1): 37.

CROKER, RICHARD S.
1936. Smoked, Salted and Dried Sea Foods of California, Calif. Fish and Game, 22 (1): 1-12.

DOLEV, AMI and H. S. OLCUTT
1965. The Triglyceride of Sablefish (Anoplopoma fimbria). I. Quantitative Fractionation by Column Chromatography on Silica Gel Impregnated with Silver Nitrate, J. Amer. Oil Chemists Society, 42 (part 2): 624-627.

LITERATURE CITED (Contd.)

ORCUTT, H. G.
1969. Bottomfish Resources of the California Current System, Calif. Mar. Res. Comm., Cal COFI Rept., 13: 53-59.

PACIFIC MARINE FISHERIES COMMISSION
1954. (The Sablefish Fishery of the Pacific Coast), Pacific Marine Fish Comm. Bull., 3, 130 pp.

PHILLIPS, J. B.
1958. The Fishery for Sablefish, Anoplopoma fimbria, Calif. Fish and Game, 44 (1): 79-84.

SCHICK, GEORGE B., JOHN D. ISAACS, and MEREDITH H. SESSIONS
1968. Autnomous Instruments in Oceanographic Research, Fourth National I.S.A. Marine Sciences Instrumentation Symposium, Cocoa Beach, Florida, unpublished.

THOMPSON, WILL F.
1941. A Note on the Spawning of the Black Cod (Anoplopoma fimbria), Copiea (4): 270.

THE ATLANTIC ALBACORE FISHERY

Grant L. Beardsley Jr.

The albacore, Thunnus alalunga, is one of the world's most sought-after tunas. It is also one of the most valuable: in 1969, exvessel prices for albacore landed on the west coast of the United States were around $450 a short ton; yellowfin tuna brought about $330, and premium skipjack tuna $280. More than half of all albacore landed in the world is consumed in the United States. However, U.S. production does not meet the demand. The deficit is filled with imports of over 100,000 tons annually (fig. 1).

Albacore rarely form compact surface schools, so purse seines, which have become the primary gear used by U.S. fishermen for yellowfin and skipjack tunas, are not suitable for catching albacore. They are caught on the surface primarily with live bait and by trolling; larger fish living well beneath the surface are taken by longlines.

Japanese Began in 1956

In 1956, the Japanese began exploratory longline fishing in the Atlantic Ocean. They set approximately 131,000 hooks and caught over 1,000 albacore. From this inauspicious start they rapidly expanded their fishing effort until, in 1964, Japanese vessels fished over most of the North and South Atlantic Oceans between 40° N. and 40° S. They set almost 100 million hooks, and caught over 2 million albacore.

Before 1964, the Japanese fished primarily for yellowfin tuna but, in that year, reacting to rapidly declining catch rates, they shifted their fishing to good albacore areas. In recent years, declining catch rates for both species have forced the Japanese to cut back their effort in the Atlantic. In 1967, for example, they set slightly over 30 million hooks compared to almost 100 million in 1964 (from approximately 160 vessels). However, this decrease in effort probably has been counterbalanced by a rapid increase in longline fishing by China (Taiwan), Cuba, Panama, South Korea, and Venezuela. Recent estimates place the number of vessels operating in the Atlantic from those countries at 100 to 150, but their catching efficiency is probably below that of the Japanese.

Bay of Biscay Albacore

The only other fishery for albacore in the Atlantic is the surface fishery in the Bay of Biscay; the French and Spanish land about 40,000 tons annually. This fishery begins in May or June and extends through October, or occasionally into November; best fishing is in July and August. Fishing is with trolling lines or live bait. Trolling boats are 30 to 75 feet long and are manned by crews of 6 to 12 men. Each boat fishes 9 to 10 lines and trolls at about 6 knots. Three to 4 tons a day are considered an excellent catch.

Albacore caught in the Bay of Biscay are small compared to those captured by longlines. A 15- to 20-pound albacore is classified as large in the surface fishery; 45 pounds is the average size of albacore taken by longliners in the Atlantic. The few albacore caught in equatorial waters are normally very large, often averaging 65 pounds.

Picture of Albacore Abundance

Detailed statistics on catch and effort of the Japanese longline fleet are available from publications of the Fisheries Agency of Japan and the Nankai Regional Fisheries Research Laboratory. Analyses of these data have produced a clear picture of the distribution and relative apparent abundance of albacore in the Atlantic Ocean.

The average number of albacore caught per 100 hooks set was calculated for each 5° square of latitude and longitude in the Atlantic by totaling the number of albacore caught in a given square in a given month, multiplying by 100, and dividing by the number of hooks fished in that square during the same period. This number was used to indicate concentrations.

Mr. Beardsley is Fishery Biologist, BCF, Tropical Atlantic Biological Laboratory (TABL), Miami, Fla. 33149.
TABL Contribution No. 155.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Reprint No. 875

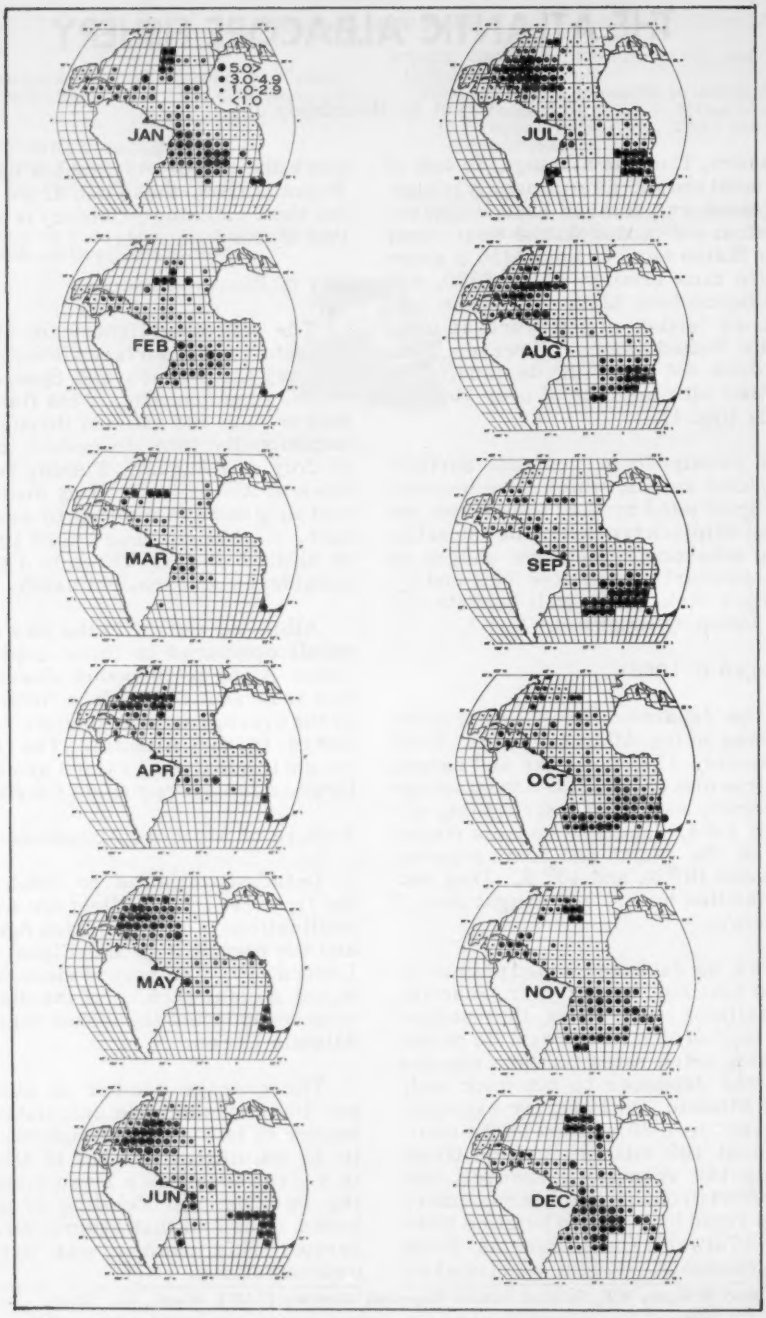


Fig. 1 - World tuna catch and U.S. albacore catch and consumption 1964 through 1968.

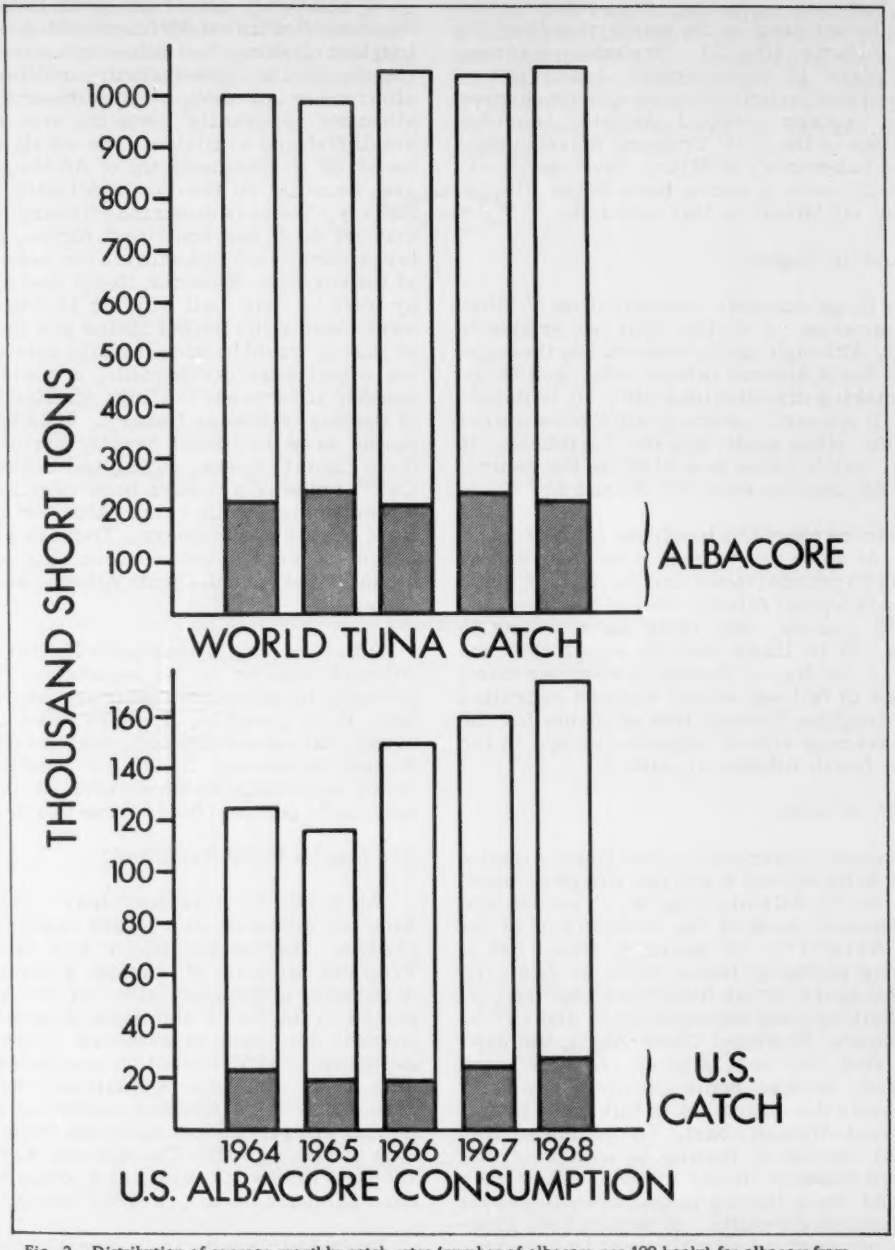


Fig. 2 - Distribution of average monthly catch rates (number of albacore per 100 hooks) for albacore from Japanese Atlantic longline fishery, 1956-1967.

In summer, albacore are concentrated over a broad area on the western side of the North Atlantic (fig. 2). Probably spawning takes place in this period. Japanese researchers reported capturing albacore larvae in the western tropical Atlantic in June; scientists of the BCF Tropical Atlantic Biological Laboratory in Miami have caught albacore larvae in plankton tows in the Florida Current off Miami in May and June.

2 Groups in August

The large summer concentration of albacore appears to divide into two groups in August. Although catch rates are low throughout the North Atlantic in September and October--making distributions difficult to determine--it appears that one group moves northeast, the other south into the Caribbean. In winter, catch rates are high in the central North Atlantic between 30° N. and 45° N.

Albacore caught by longlines in the central North Atlantic in winter often average as little as 25 pounds; those caught in the Caribbean and tropical Atlantic rarely average less than 45 pounds, and often as much as 65 pounds. It is likely that the small albacore found in the Bay of Biscay in summer move offshore in fall and winter and are recruited to the longline fishery; this accounts for the small average size of albacore caught in the central North Atlantic in winter.

In South Atlantic

Albacore movements in the South Atlantic appear to be almost a mirror image of those in the North Atlantic (fig. 2). The fish are abundant over most of the western half of the South Atlantic in summer (Dec.-Feb.). Spawning probably takes place at this time since albacore larvae have been captured off the Brazilian coast between 10° S. and 30° S. in February. In winter (June-Aug.), the Japanese find the best fishing off Angola and Southwest Africa. Some albacore, however, do not make the migration in fall from Brazil to the West African coast. The Japanese discovered excellent fishing in winter off the southern coast of Brazil in 1961. They have expanded their fishing in that area in recent years with good results. In September, albacore move west and slightly south in a migration back to their summer grounds in the western South Atlantic.

A relatively small area off the coast of South and Southwest Africa provides excellent longline fishing for albacore almost year round. In the winter, both small and large albacore are present, but in summer the large albacore apparently leave the area and only small fish are available. The small albacore found off the southern tip of Africa probably are recruits to the South Atlantic longline fishery. There is no surface fishery for albacore off South and Southwest Africa, although large numbers of albacore have been sighted at the surface. It seems likely that a fishery by troll or live bait similar to those on the west coast of the United States and in the Bay of Biscay would be successful in this area. If the effort were comparable, it would be reasonable to forecast landings similar to those of the Bay of Biscay fishery. This South Atlantic area is fished heavily by longliners from China (Taiwan), Japan, and South Korea. Catch rates of albacore have remained consistently high, while catch rates for albacore were declining elsewhere. There is also evidence of considerable movement of small albacore between the South Atlantic and Indian Oceans.

Albacore populations in the North and South Atlantic appear to be separate. There is probably little intermingling across the equator. It is possible, however, that in warm equatorial waters albacore descend below the depths commonly fished by longline gear; hence estimates of abundance in this area may not be comparable to those in other areas.

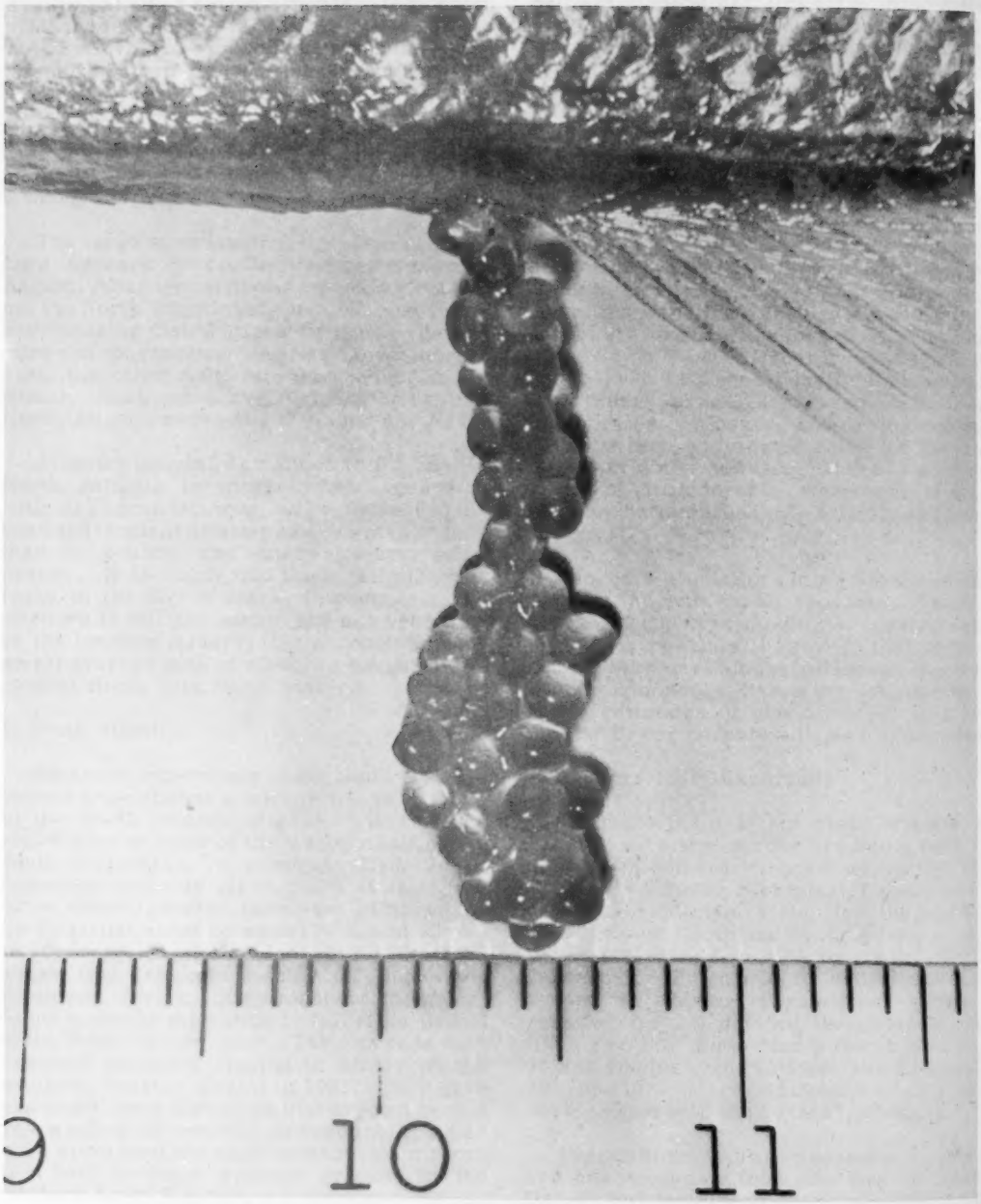
Are Stocks Fully Exploited?

At present, it is not clear whether the Atlantic albacore stocks are being fully exploited. Studies are under way at the BCF Tropical Atlantic Biological Laboratory to determine optimum yields for the albacore stocks in the North and South Atlantic. A 50 percent decrease in albacore catch by the Japanese in 1967 cannot be considered a decrease in albacore populations--rather, it resulted from a decided lessening of their fishing effort. Undoubtedly the rapid expansion of fishing by the Chinese and Koreans in 1968 and 1969 will reveal catch totals for albacore comparable to pre-1967 levels.

French biologists are presently collecting and analyzing data from the Bay of Biscay fishery to determine migrational patterns, the

effects of fishing, and optimum yields from the surface fishery. These studies are important because the small albacore in the Bay of Biscay fishery undoubtedly are the recruits to the North Atlantic longline fishery.

The one region that might produce a significant contribution to an increased albacore catch in the Atlantic seems to be the waters off South and Southwest Africa. Apparently large numbers of albacore are available on the surface there, but no surface fishery exists.



Cluster of eggs stripped from ripe Pacific saury **(scale is in millimeters).**
(Photo: R. C. Counts & A. M. Vrooman, BCF, La Jolla, Calif.)

SEASONAL AND GEOGRAPHIC CHARACTERISTICS OF FISHERY RESOURCES

California Current Region--II. Pacific Saury

David Kramer and Paul E. Smith

This is the second in a series of reports[1] in which we are describing characteristics of the fishery resources in the California Current region, emphasizing predictions of the times and localities of adult fish spawning and suggesting the potential for production of the spawning resources. We did this for the jack mackerel (Kramer and Smith, 1970) and will now do the same for the Pacific saury.[2]

Data of the California Cooperative Oceanic Fisheries Investigations (CalCOFI) indicate that major centers of the spawning populations of the Pacific saury can first be located in January in a relatively small area about 150-200 miles offshore from southern California and northern Baja California.

A major center of spawning is where 20 percent or greater occurrence of saury eggs is found in standard plankton hauls--fig. 1. In February and March, the centers of spawning spread inshore and northward to Point Conception and, in April, May and June, to San Francisco. Although eggs may be found as far south as Magdelena Bay, the major spawning centers seldom extend much farther than northern Baja California.

It can be assumed from egg data and visual observations (Smith, Ahlstrom, and Casey, 1970) that the saury ranges at least from southern Baja California to the Gulf of Alaska. The CalCOFI pattern does not delimit saury spawning (fig. 1). But a survey by BCF's Honolulu Laboratory in spring 1956 (fig. 2) and the NORPAC survey in late summer (August) 1955 (fig. 3) showed that spawning extends at least to 180° W. longitude. Smith, Ahlstrom, and Casey have stated that spawning probably occurs completely across the Pacific. From data for 2 months of peak spawning--April and May--Smith, Ahlstrom, and Casey estimated the spawning resource at about 500,000 tons in the CalCOFI area. The 2 peak months were used for this estimate because the unusual spawning behavior of the saury introduces two sources of error in the estimate of the size of this resource: First, the saury is a repetitive spawner in 2-month intervals during the year (Hatanaka, 1956). Thus, if eggs are sampled continually it is most likely that the same populations may be repetitively sampled and overestimated. Second, saury eggs are adhesive and often collected in clumps of 20 or more; this diminishes the precision of sampling because the eggs are not independently distributed. Saury eggs found outside the pattern, as noted above, indicate that there may be as much spawning out of the pattern as in it--and thus would increase the estimate of resource size possibly by an equal amount.

Smith, Ahlstrom, and Casey pointed out that the saury is not likely to be available to the fisherman in the CalCOFI survey pattern during its spawning cycle. Their data from visual observations during spawning and non-spawning periods indicate that the saury might be most available during September through December and, most likely, in the areas from San Diego to northern California and Oregon--with the maximum numbers 40 miles and more offshore. Novikov and Kulikov (1966), in their account of Russian surveys off the west coast of North America, reported that the most dense concentrations of adult saury were between latitudes 42°18' and 44°22' in August, October, and November at water temperature 54°-55° F. (12.5-13.5° C.).

The authors are Fishery Biologists, BCF Fishery-Oceanography Center, La Jolla, California.

[1] These are introductions to existing and forthcoming comprehensive reports and analyses based on more than 20 years of intensive research by the CalCOFI--founded in 1949 to determine the reasons for the decline of the sardine resource.

[2] Organizations, area of investigations, and treatment of the data were presented in the report on jack mackerel.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Reprint No. 876

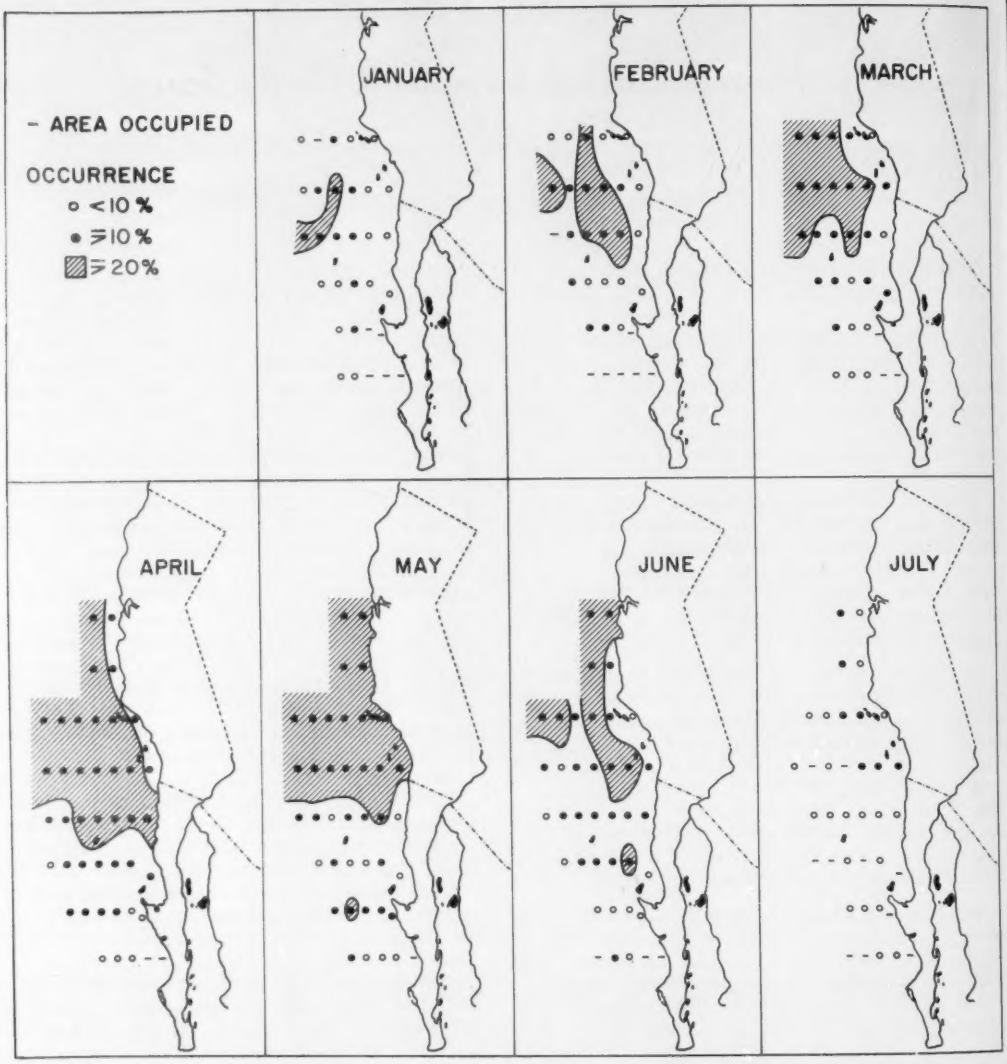


Fig. 1 - Percent occurrence of saury eggs in 1951-60 on the survey pattern of the California Cooperative Oceanic Fisheries Investigations (CalCOFI)--see figure 2.

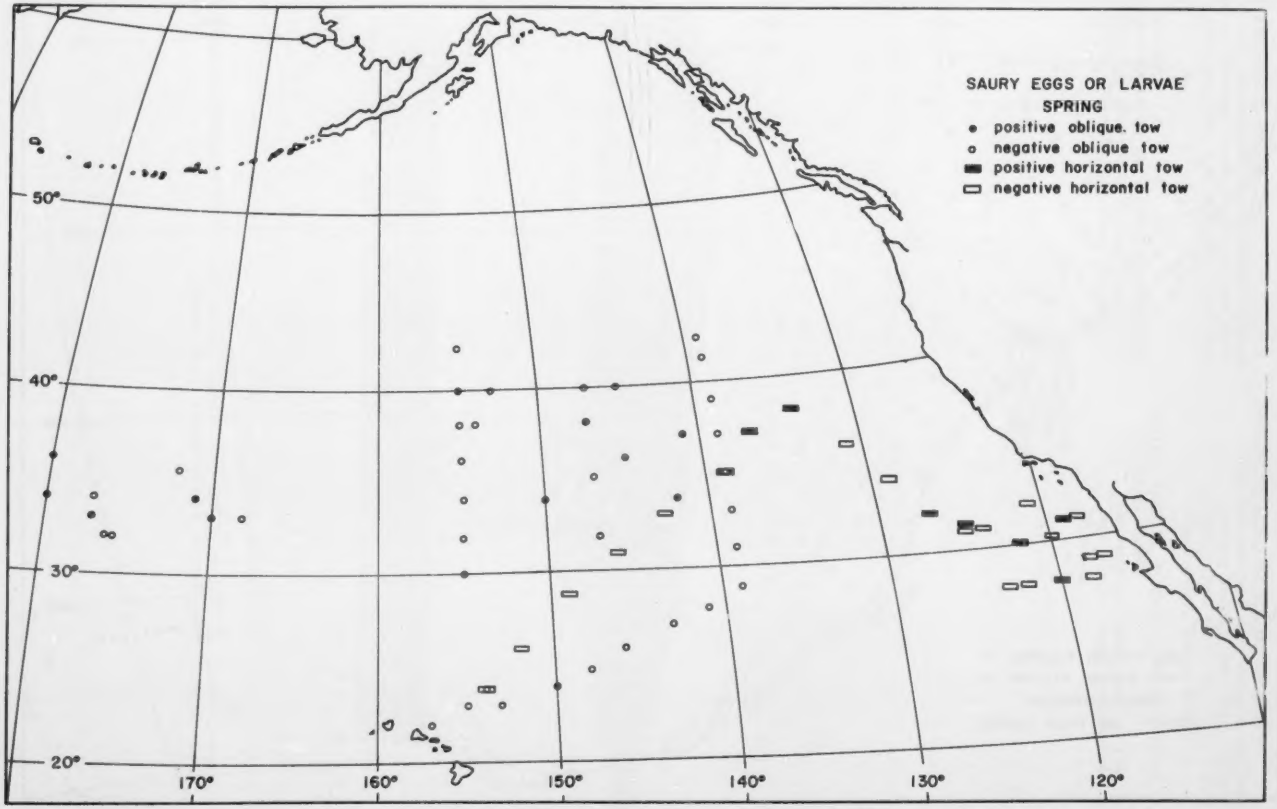


Fig. 2 - Distribution of saury eggs or larvae from survey by the BCF Honolulu Laboratory in the spring of 1956 (figure 4a of Smith, Ahlstrom, and Casey, in press).

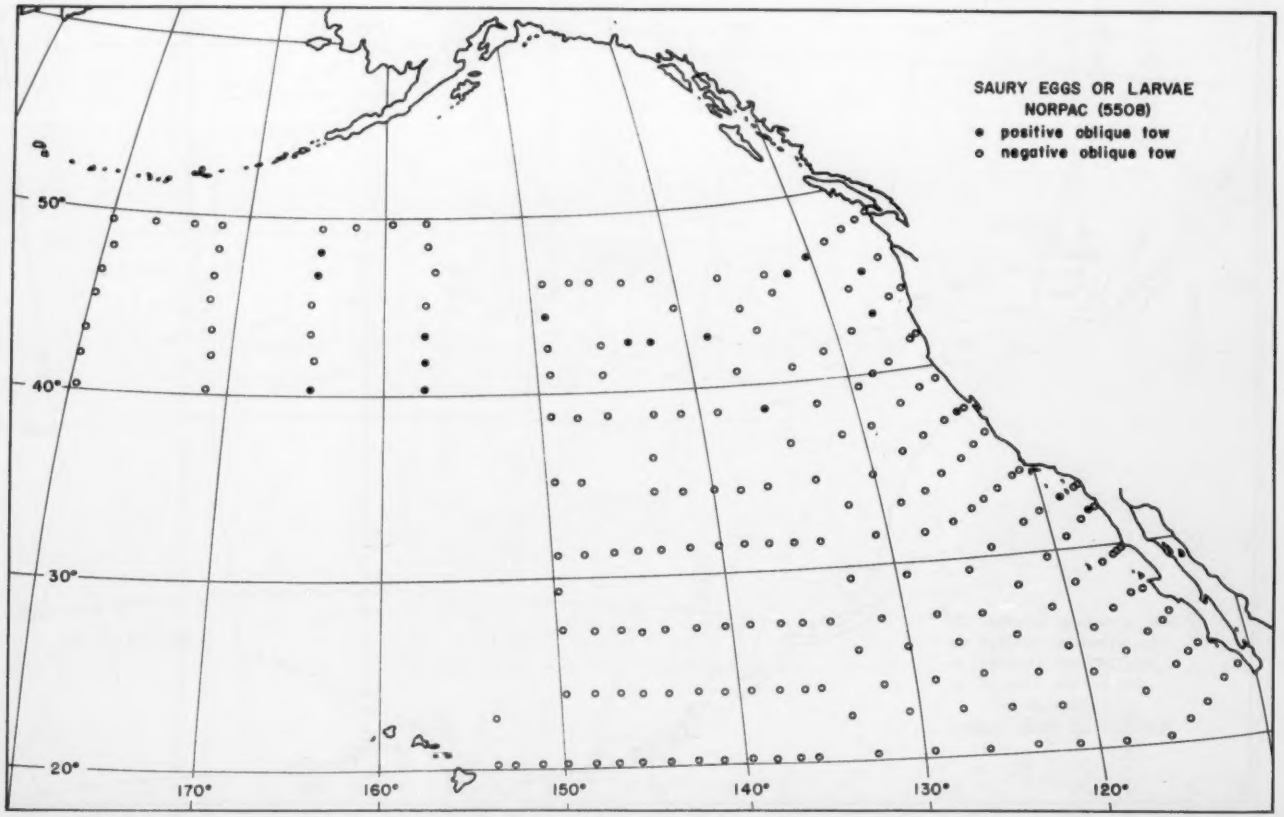


Fig. 3 - Distribution of saury eggs or larvae from NORPAC survey in late summer, August 1955 (figure 3 of Smith, Ahlstrom, and Casey, in press).

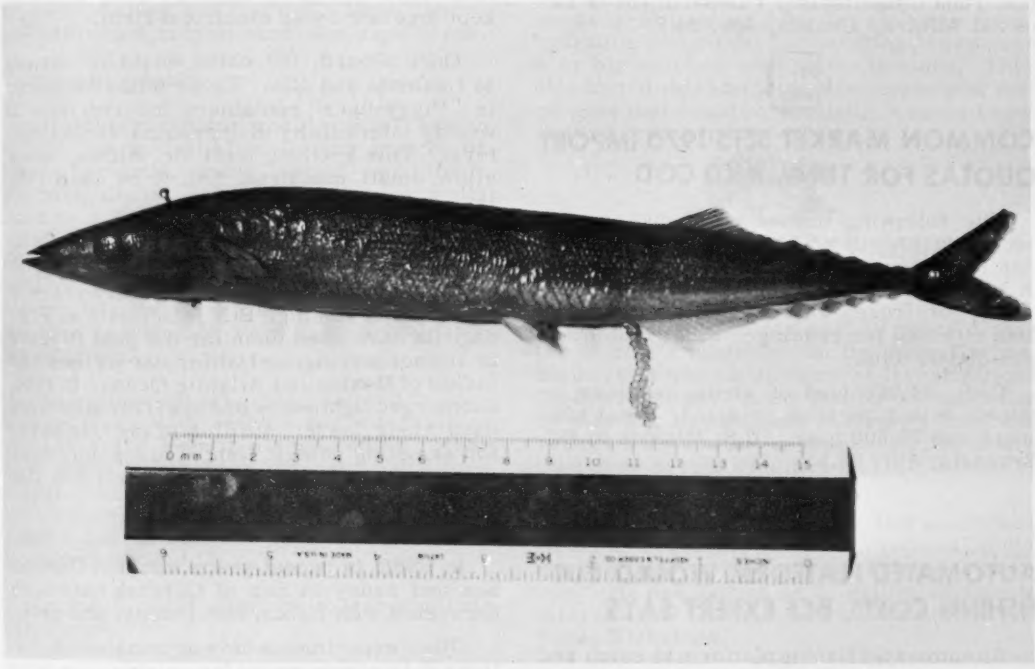
LITERATURE CITED

KRAMER, DAVID and PAUL E. SMITH
1970. Seasonal and geographical characteristics of fishery resources, California Current Region--I. Jack Mackerel. Commer. Fish. Rev. May 1970. (Also Rep. No. 871)

HATANAKA, MASAYOSHI
1956 a. Biological studies on the population of the saury, Cololabis saira (Brevoort). Part I. Reproduction and growth. Tohoku J. Agr. Res. 6:227-269.

NOVIKOV, N. P. and YU. M. KULIKOV
1966. Perspektivny i raion promysla sairy (Prospective region for saury fishing). Ryb. Khoz. 42(7):20-21. (Translation, Bur. Commer. Fish., Off. Foreign Fish., Dep. Interior, Wash., D.C.)

SMITH, PAUL E., ELBERT H. AHLSTROM and HAROLD D. CASEY
1970. The saury as a latent resource of the California Current. Calif. Coop. Oceanic Fish. Invest. Rep. 14: (in press).



Pacific saury--stripped, showing cluster of eggs (about 9 inches fork length or 22 cm. standard length). (Photo: R. C. Counts & A. M. Vrooman, BCF, La Jolla, Calif.)

INTERNATIONAL

CANADA & U.S. AGREE ON RECIPROCAL FISHING

On April 24, 1970, Canada and the U.S. concluded an Agreement on Reciprocal Fishing Privileges. It was signed for Canada by Dr. A. W. H. Needler, Deputy Minister, Department of Fisheries and Forestry, and for U.S. by Ambassador Donald L. McKernan, Special Assistant for Fisheries and Wildlife, Department of State.

Amb. McKernan was in Ottawa for the annual meeting of the Inter-American Tropical Tuna Commission. ('Department of External Affairs,' Canada, Apr. 24.)

COMMON MARKET SETS 1970 IMPORT QUOTAS FOR TUNA AND COD

The following import tariff quotas have been established by The European Communities (Common Market) for fishery products in 1970: 53,000 metric tons of fresh, refrigerated, or frozen whole, headless, or sliced tuna intended for canning. Final 1969 quota was 65,000 tons.

Cod: 34,000 tons of whole, headless, or sliced, salted, pickled, or dried. Final 1969 quota was 39,500 tons. (U.S. Mission to EC, Brussels, Apr. 28.)

AUTOMATED PLATFORM WOULD CUT FISHING COSTS, BCF EXPERT SAYS

An automated fishing platform to catch and process fish virtually without fishermen was proposed to an FAO meeting as a way of exploiting coastal fisheries, which are otherwise uneconomic.

The suggestion was contained in a paper prepared by E. F. Klima of BCF Exploratory Fishing and Gear Research Base, Pascagoula, Mississippi, for the FAO technical conference on fish finding, purse seining, and aimed trawling held in Reykjavik, Iceland, May 24-30.

Klima cited the problem of steadily rising fishing costs and the need to catch more fish to meet growing world needs.

The Platform

His automated platform would be equipped with underwater lights anchored in the depths to tentlike, submerged, rafts. The lights, moving upwards in sequence, would lure the fish below to a pump intake. They would be kept together by an electrical field.

Once aboard, the catch would be reduced to fishmeal and oils. These would be stored in "Piggy-back" containers for retrieval at weekly intervals by motherships or helicopters. This method, said Mr. Klima, would allow small industrial fish to be caught for less than half the current cost.

Lights Used For Years

Lights have been used for many years in commercial fishing. BCF scientists at Pascagoula have used them for the past 10 years to attract herringlike fish for use as tuna bait in Gulf of Mexico and Atlantic Ocean. In 1966, submerged lights attached to a fish pump were used along lesser Antilles in the Caribbean for sampling pelagic fish; at one point, catch rates reached a peak of 900 to 1,800 fish pumped per minute.

USSR

In USSR, in recent years, sprat in Caspian Sea and saury in Sea of Okhotsk have been harvested with lights, fish pumps, and nets.

Other experiments have demonstrated that fish can be concentrated for catching by using pulsed, direct-current electricity--and that small submerged rafts can attract large concentrations of coastal pelagic fish.

These results, Klima added, show possibility of building and using automated platforms--using a combination of lights and submerged rafts--to catch small pelagic species for industrial purposes.

Plans for building a platform are under way at Pascagoula, Klima revealed.

△△△△△△△

COMPUTER CAN SPEED FISHERMEN TRAINING, SAYS BRITISH EXPERT

Fishing training could be speeded through use of a 'computerized simulator' that would reproduce actual operations and situations aboard fishing vessels. This was theme of a paper prepared for FAO's Technical Conference on Fish Finding, Purse Seining and Aimed Trawling held in Reykjavik, Iceland, May 24-30.

The paper was written by R. Bennett, Industrial Development Unit, British White Fish Authority in Hull. He discussed need for improved education and training to keep abreast of advances in fishing technology during past 15-20 years. He warned of growing gap between technology and training. Most fishermen still must rely on hard-won experience.

Training Simulator

A training simulator would enable trainees to "fish" on an imitation fishing ground, or several grounds, under "actual" conditions. All navigational and fishing aids normally found on a fishing vessel would be built into the simulator; it would be based on a digital computer with a library of tapes. Each trainee would occupy a cubicle with its own set of instruments. He would maneuver the vessel and gear as though he were in an actual fishing situation.

The system could be programmed to provide trainees with options and alternatives that can arise even in a single day's operation. They would have choice: spend time changing a trawl to suit a possibly short-term behavior of fish, or keep fishing with same trawl at reduced catch rate, or move to another ground.

Trainees could compete to see who gets best "catch."

Study Development of Simulator

Bennett says that the White Fish Authority is studying development of such a simulator over the next 2-3 years. The Norwegian Fisheries College has begun similar work. The main limitation is high cost of constructing a system that can reproduce faithfully all situations and variables in fishing.

The increasingly complex equipment and techniques in fishing are forcing a change in attitudes in fishermen's training, FAO states. It is no longer feasible economically to have skippers learn how to use new instruments at sea. Simulators help to teach some aspects of fishing on shore in a shorter time and more cheaply, as Bennett indicated.

In recent years, trawling and purse-seining techniques have been affected profoundly by developments in fish-finding equipment, such as echo sounders, sonar and netsonde. This equipment has paved way for midwater trawling, aimed bottom trawling, and purse seining for deep-swimming schools. At same time, hydraulic equipment for handling heavy gear with big catches have come into use. This eliminated old restrictions on size of gear and catches that could be handled. It opened new and important fisheries.

BERNARD SKUD HEADS HALIBUT COMMISSION INVESTIGATIONS

Bernard E. Skud, for past 10 years director of BCF's laboratory at Boothbay Harbor, Maine, was named Director of Investigations for International Pacific Halibut Commission on May 19. He succeeds F. Howard Bell, who retires July 4 after 45 years. Mr. Skud will take over in late summer.

Skud served BCF 20 years. His immediate fields of research have been population dynamics, marine biology, and estuarine ecology. He has served as scientific advisor to International Commission for Northwest Atlantic Fisheries.

Market place of Rach Gia, S. Vietnam, major fishing port on Gulf of Thailand. (Keith Brouillard)

SOUTH VIETNAM: A FISHERY DEVELOPMENT SURVEY

Keith D. Brouillard

During January-April 1970, a general survey of the fisheries of South Vietnam was conducted at the request of the United States Agency for International Development (USAID). A summary of the findings and the recommendations is the basis of this report.

The gross national product (GNP) of South Vietnam has been increasing slowly over the past five years. At constant 1960 prices, the GNP increased from 107.6 billion piasters in 1965 to 122.4 billion in 1969. In current prices, however, the GNP for 1965 was 114.7 billion piasters; for 1969, 532 billion piasters. Current prices reflect the severe economic problems confronting South Vietnam--particularly inflation.

Fishery production has been satisfactory from the standpoint of total landings--especially during wartime. In 1965, production was 375,000 metric tons; in 1969, 463,800 metric tons. The use of motorized vessels increased from 12,240 in 1965 to 39,000 in 1969. Increased production under adverse conditions is the result of the motorization program begun on a major scale in 1965.

Several major problems confront the fishing industry and limit its expansion and the availability of fish to the consumer: lack of modern landing facilities, transportation units, refrigerated equipment, and modern fishing vessels. In addition, the military buildup has taken many highly skilled fishermen from the fleets.

GENERAL ECONOMY

The status of the general economy must be considered when discussing possible means of improving the contribution of any segment of it: in this paper, fisheries. Adequate data are available on the economy to indicate the problems affecting fishery development.

The current exchange rate of 118 piasters per U.S. dollar is unrealistic. Imports are undervalued and exports overvalued. For fisheries, this situation is both bad and good. The export of fishery products under the current exchange rate is not possible. For example, the current Saigon wholesale price for shrimp is the equivalent of something over $2 per pound, heads off. On the other hand, the cost of modern equipment needed to develop the fisheries is available at a reasonable piaster cost. However, imports are subject to controls and the availability of foreign exchange. These limit modernization of the fishing industry.

Mr. Brouillard is Chief, BCF Office of Technical Assistance, 801 19th St. NW., Washington, D.C. 20006.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Reprint No. 877

Inflation

The inflationary factors affect fishing and other industries. The data in Table 1 are an indication of inflationary development. An optimistic projection made by USAID for the economy in 1970 contains an inflationary factor of 20% to 30%; this limits further the prospects for development of an export market. Fortunately, the domestic price of fish has kept pace with the general economy--permitting continued production of fish without undue monetary harm to the fishing industry.

Table 1 - Republic of Vietnam Expenditures on Gross National Product
(Billions of Piasters)

I. CURRENT PRICES

	1964	1965	1966	1967a/	1968a/	1969a/
Private consumption	92.4	109.1	177.0	286.0	334.0	428.0
Public consumption	25.0	32.5	52.9	75.3	88.0	115.0
Gross capital formation	12.6	17.1	34.5	40.0	40.0	45.0
Exportsb/	7.8	12.0	30.5	33.7	34.0	40.0
Less Importsb/	-23.0	-28.6	-76.0	-110.7	-102.0	-121.0
Net factor income from abroad	- .5	2.6	17.4	20.0	20.0	25.0
GNP	114.3	114.7	236.2	344.3	414.0	532.0

II. CONSTANT 1960 PRICES

	1964	1965	1966	1967a/	1968a/	1969a/
Private consumption	76.4	77.9	77.6	87.5	80.7	84.8
Public consumption	21.6	24.9	33.9	38.0	42.4	49.3
Gross capital formation	11.0	13.4	19.5	18.0	18.0	17.8
Exportsb/	7.4	9.9	15.4	20.2	12.0	11.6
Less Importsa/	-17.1	-20.4	-45.5	-56.8	-48.6	-48.2
Net factor income from abroad	- .4	1.9	8.3	6.5	7.2	7.2
GNP	98.8	107.6	109.1	113.3	111.8	122.4

a/Provisional
b/Goods and services except investment income at effective exchange rate.
Source: National Bank of Vietnam (February 1970 Revision)

When you consider the problems facing S. Vietnam, it is not surprising that inflation has caused economic difficulties. What is somewhat surprising is that the problems are not more severe. When the level of hostilities is lessened, or the war ends, the Government will have to make difficult political decisions if export markets are to be developed. Either an export subsidy or devaluation appears necessary to expand exports, including fishery products.

GENERAL FISHERY SITUATION

The latest complete fishery statistics are for 1969. Table 2 presents the general fishery situation for 1963 through 1969. There appears to be steady growth. However, certain factors affecting production are not apparent. Production in 1968 was affected adversely by the Tet and post-Tet offensives of the Viet Cong. There is little doubt that production was reduced in some provinces; and the marketing problems created by deteriorating security may have restrained production in some areas.

Army Takes Fishermen

There are other problems: the lack of skilled fishermen and closure to fishing of certain areas of the coast due to security problems. No data are available on age structure of the fishing population; however, observations and discussions with provincial fishery directors indicated that the active fishing community consists primarily of boys and old men, plus some women. The more

Table 2 - Summary of Fishery Statistics, Vietnam, 1963-1969

Item	1963	1964	1965	1966	1967	1968	1969
Fishermen (No.)	243,390	245,520	243,500	253,770	270,408	272,300	277,100
Fishing Boats (No.):							
Motorized	9,220	9,710	12,240	16,770	23,195	29,968	39,001
Nonmotorized	44,530	46,760	46,240	48,380	52,995	47,991	42,955
Catch (Metric tons):							
Marine fish	299,340	314,000	289,000	287,450	319,500	321,645	355,488
Freshwater fish	49,900	52,000	57,000	64,710	59,500	51,045	63,673
Crustaceans, mollusks	29,430	31,000	29,000	28,340	31,700	37,310	44,683
Processed Products:							
Dried (Metric tons)	18,370	19,410	17,500	16,000	15,000	20,205	20,769
Cured (Metric tons)	31,370	32,170	28,100	30,500	35,024	24,830	30,242
Canned (Metric tons)	234	215	232	205	185	100	20
Fish sauce (1,000 liters)	60,000	63,000	57,000	59,000	61,000	59,000	60,850

Source: Directorate of Fisheries, Republic of Vietnam.

active and stronger fishermen, who would normally operate the boats are, for the most part, in the military services. The current fleet is not operating at highest efficiency.

Closed Coastal Areas

The closure of coastal areas existed through 1968 and 1969. Recently, some restrictions have been lifted. Further relief can be expected if security continues to improve. The opening of coastal areas will be an important factor in production by smaller boats--those limited in ability to fish in nondaylight hours. This would include majority of boats, but not necessarily major part of production capability. The larger and more efficient vessels are affected to a limited degree by the coastal closures, but they are able to continue production outside those areas. It is not possible, therefore, to determine the overall impact on total production resulting from the closures, but they have been a restraint.

No Deep-Water Ports

In general, there are no deep-water ports for the fishing fleet, so greater use of larger modern vessels is limited. Currently, the traditional boats land during high tides at many points on the coast. The one exception is the port of Saigon, where large vessels can land.

Fishing-port development plans should cover two general categories: 1) ports suitable for improvements that would benefit existing fleet; 2) ports with potential for development as deep-water ports for large modern fishing vessels.

No Cold-Storage Facilities

There are no cold-storage facilities at any major coastal fishing ports. In some areas, there is a severe shortage of ice. This boosts ice prices and limits its use. Fortunately, the Vietnamese are skilled in producing fish sauce. They make use of all fish produced and thus solve problem of preservation. Nonetheless, additional supplies of fresh fish are needed. The lack of cold-storage facilities, other than those recently constructed in Saigon, has hampered fishermen's ability to meet that need.

Catch Value

No statistics are available on production by species, or prices, so it is not possible to place an accurate value on production. The species used for fresh consumption probably average 80 piasters per kilo paid to the fishermen, while fish used for fish sauce are lower priced. If an overall exvessel price of 60 piasters per kilo is used as basis for determining catch value, it would exceed 27 billion piasters for 1969, roughly 5% of gross national product. However, the price used is arbitrary, and accuracy of production statistics is questionable.

More Motorized Vessels

The most significant factor in Table 2 is rapid expansion in use of motorized vessels. Production has been maintained and, to some degree, increased as result of motorization program. The 1968 Tet offensive and draft of skilled fishermen tended to negate effect of motorization program. Unfortunately, the program may be creating problems by increasing the effectiveness of vessels operating in limited geographic areas and on limited resources--thereby reducing yield and possibly resulting in overfishing.

POTENTIAL PROBLEMS

Solutions to many problems facing fishery development are not readily determined, but some potential problems should be pointed out.

Production

Fishing effort is concentrated in a narrow belt of sea from the beach to approximately 20 kilometers off shore. In some areas, the inshore fishery is limited by security restrictions but, in general, the zone begins at the beach. Even with relatively inefficient units, their sheer number is placing tremendous pressure on existing resources.

Strangely enough, there are a few resources in the heavily exploited area that do not appear severely pressured, primarily because of the gear used. Examples are the lobster and shrimp populations along some areas. In general, however, fishery resources are heavily exploited.

Caution should be exercised in expanding fishing effort within the exploited zone. Preliminary studies should be made on catch per unit of effort and estimates of populations. It does not appear that the offshore fisheries will have problems of overexploitation in the near future--assuming foreign fleets do not expand operations.

Vessels

About 12 large vessels fish off shore and land catches in Saigon. Most of these vessels are used pair trawlers purchased from Japan. If such purchases continue, there is a serious danger that the limited foreign reserves will be wasted. Investments would produce some profit in immediate future but would not be satisfactory for competing with foreign fleets or new imported vessels operating in the same waters.

South Vietnam should seriously consider limiting funds to buy used vessels and insist on investing in new, efficient vessels. Ideally,

the Government should encourage the use of domestic facilities to construct new fishing vessels. This would save some foreign exchange and develop broader base of expertise in marine construction.

Transportation

At present, it is not possible to use the railroad or highways from Da Nang to Saigon to transport perishable foods. When the war ends, this situation will be corrected to some degree, and highway conditions improve. However, transportation of fishery products will not be reliable in the near future. Only a few transportation units are available for movement of perishable products. No refrigerated trucks are available. There appears to be no need to transport fish from northern areas to Delta area. Rather than expand efforts to move fish in a north-south direction, efforts should be directed toward movement inland, or to develop an exportable product.

Marketing

The distribution and marketing of fishery products will remain a problem. At present, the coastal areas seem to have adequate supplies to meet nutritional needs, albeit at high prices, if based on official rate of exchange. However, the upland areas lack adequate supplies. It may be years before their needs can be met.

Lack of transportation and export market may result in relatively limited market. The fishing industry may receive declining returns on investment if production increases substantially. This may not be entirely bad because consumer might benefit somewhat. But it does make possible a situation where middlemen can manipulate prices with relative ease.

Perhaps the most irritating problem that can be expected to continue is the power of the middlemen. One of the major reasons why they have not been eliminated from the marketing system is the simple fact that they perform a service no one else is prepared to perform. They collect enough fish from small fishermen scattered over a wide area to get economic transportation rates to the markets. They lend money with no collateral or formal agreements. So far, all suggestions to change the system have either been ineffective or unrealistic.

Fishermen pay a high price for these services, but no one else but middleman is prepared to perform similar services. Until efficient and convenient landing facilities and easy credit are available, middlemen will continue to play major role.

One bright spot in the picture is the possible establishment of a competing marketing system by owners of the large fishing vessels now beginning operation. The owners have capital, or can obtain it, to establish cold storages for orderly marketing of their catch. It would become possible then to divert some production of small units through marketing channel established by larger operating units. The change would reduce significantly the middleman's influence.

Competition

Because statistics are lacking, it is nearly impossible to project the possible demand for

fish compared with demand for other protein foods. Studies have been made of Saigon market. There appears to be a relationship between price of fish and price of other animal protein food on any given day. Apparently a large supply of chickens or hogs on the local market causes a rapid reduction in fish price, assuming normal supplies of fish are available. On the other hand, a heavy supply of fish tends to reduce price of chicken and pork, but not to the same degree as the reverse situation.

Foreign Trade

At present, no surplus of fishery products exists that could be exported under the present price structure and official exchange rates. A potential exists, particularly for such luxury items as shrimp and lobster. However, no facilities exist for processing fishery products at landing sites. Any exported fishery product must compete on the world market in price and quality.

For example, new shrimp grounds are being developed off South America's coast. Current estimates of potential production indicate area could be a major producer. Experienced shrimp fishermen and processors are investing in that area; therefore, it may be assumed that the product will meet world standards in quality and price. Under current conditions in Vietnam, it does not appear possible that an acceptable product could be produced, even if product were competitive in price.

Other fishery products may be exportable--red snapper and other finfish. The same conditions apply to these products: they must compete. There is an apparent abundance of red snapper in the South China Sea. No estimates are available on potential production, but the Directorate of Fisheries has estimated that in Rach Gia it could reach 200 to 300 metric tons per month with existing units of production, if the incentive existed. Red snapper is not considered a highly desirable species in Vietnam. It is doubtful, however, that the product would be competitive on world market under existing conditions.

Imports

Some canned fish are imported. Much fish meal is imported: about 2,865 metric tons in 1968, and a predicted 1972 level of 10,000 metric tons. There has been a strong interest in Vietnam to produce fish meal and canned fish primarily for domestic consumption, but also for exporting canned fish. Under current conditions, it is unrealistic to consider such products for export.

There are no can-making facilities in Vietnam; all cans are imported. The current estimated price of fish in Vietnam is at least $500 U.S. per metric ton--unrealistic to can for export, especially with likely species: anchovy, sardines, squid, and mackerel.

If estimated price at producer's level is about right, production of fish meal is impossible if world prices are guideline. Limitations on fish-meal production could change if 2 events happened: a significant devaluation of piaster, and if Government determined import substitution was so important that heavy subsidies would be granted fish-meal industry. Both factors have much political

significance for Government. It is difficult to predict what it would do.

Other Problems

The following potential problems are significant to affect long-run development of the fishing industry.

International Considerations:

In recent years, efforts have been made to define more clearly the rights of coastal fishing nations. Currently, resources of the continental shelf are reserved to the coastal fishing nation if such resources meet the criteria established by 1958 Geneva Convention on the Continental Shelf. From observations made of the various species landed in Vietnam, there does not appear to be a large production of resources that would be protected by the Convention; however, such resources may be available but not exploited.

It is possible that new principles of international law will be developed in the near future that would protect coastal fisheries; however, such changes usually include provisions for historic rights of fishing nations. Vietnam should follow closely developments in international law that may affect fishery development. If necessary, she should participate actively in international conferences that deal with rights of coastal fishing nations to insure that her industry will be adequately protected and have opportunity to expand operations. Foreign fleets may intrude on continental shelf of Vietnam in areas not now exploited.

Cooperatives:

Most recommendations for fisheries of less-developed countries include development of cooperatives in agriculture and in fisheries. Here, these institutions are presented as problems rather than solutions. On paper, there are many fishery cooperatives. Few are operating. Fewer still perform any effective function that benefits the fishermen. For all practical purposes, cooperatives have been established to purchase fuel, ice, and motors--but none to market fish.

Also, discussions with provincial fishery directors and fishermen left impression that membership in the cooperative is a disadvantage to fishermen. For example, the Rach Gia cooperative appears managed by the same businessmen who control the availability of ice and are major purchasers and transporters of fish. A study in late 1969 and early 1970 by contractors revealed that the cost of shipping fish through Rach Gia cooperative exceeded costs of similar shipment through private broker.

As a second example, the Phan Thiet cooperative serves as a source of motors and other supplies, but loans to fishermen for major purchases using funds available to cooperative from Agricultural Development Bank are at a rate double that charged by the Bank. Bank loans to cooperative are 3%; fishermen pay cooperative 6%. It is normal for a cooperative to charge a higher rate of interest to cover costs, but double is extreme. Secondly, fishermen landing catch at market's cooperative area are required to pay all taxes

and other charges applicable to fish landings; in Phan Thiet, over 12% of catch value. While all fishermen are subject to such levies, the difficulty in collecting the charges results in a lower rate of real cost for most fishermen. In other words, fishermen landing in the area of the cooperative are charged at a higher real rate than other fishermen. It would appear, therefore, that in the two ports where an effort was made to obtain information on cooperatives, there are definite disadvantages to being a cooperative member.

While the normal answer to forming effective cooperatives is to institute a program of training for cooperative managers, discussions with USAID personnel indicated such a program has not been effective. The shortage of trained personnel makes the skill obtained through training in management of cooperatives a highly priced commodity; therefore, personnel completing the training have found it more profitable to enter private business than to manage cooperatives.

An immediate solution is not apparent. Government regulation is no answer because Vietnam does not have sufficient skilled personnel to manage and police cooperatives. Direct Government control has been ineffective where it has been attempted. Perhaps the only answer is patience and training. Eventually, effective purchasing and marketing cooperative may be formed. This goal seems a long way off.

Military Activities:

Military activities have the highest priority. However, the consequences of some should be considered seriously from viewpoint of long-term recovery of the national economy. In particular, the program of defoliation could have serious short- and long-term effects on the fisheries. An intensive program of defoliation in the area of estuaries, or where chemical runoff would enter the estuaries, could have an immediate effect through destruction of immature marine life using the area as a nursery. Detrimental long-term effects could come from a drastic change in the ecology of the area through destruction of trees and ground cover. These factors should be given serious consideration in any program of defoliation. The application of chemicals should be limited to areas where absolutely necessary.

RECOMMENDATIONS

1. Efforts should be made to assist the small fishermen in increasing their income. The use of such gear as baited hoop nets and shrimp pots, both easily fabricated from available materials, should increase catch of lobster and shrimp.

2. The insulation of fishing boats and transportation units should be given high priority.

3. The USAID Fishery Advisor should be sent publications and reports on latest developments in fisheries. This information should be passed on to Vietnamese counterparts.

4. Specialists in refrigeration, fishing equipment and methods, fishing product processing and packing, international trade in fishery products, sanitation, and marine

biology should be made available on a temporary-duty basis for service in Vietnam.

5. The Government of Vietnam should facilitate construction of cold-storage facilities by the private sector.

6. Port development for the fishing industry should be given high priority.

7. Transportation facilities for fishery products must be increased, either through domestic fabrication of refrigerated equipment or through import of such equipment.

8. Domestic construction of modern fishing vessels should be encouraged.

9. The Government should plan development of exports of some fishery products, even to extent of earmarking products for export rather than for domestic consumption.

10. The existing program of reducing restrictions on fishing areas should continue.

11. Consideration should be given to implementing regulations that prohibit fishing by large modern vessels in coastal zone presently worked by existing fleet. Vessels licensed to fish for shrimp should be exempted, but strict controls should be placed on where they may fish.

12. The collection of fishery statistics should be expanded to include landed and wholesale prices, landings by species, sizes of vessels, number of ice plants, production of ice, and number of transportation units. Additional useful statistics should be collected.

13. The training of Vietnamese, including women, in the technical aspects of fisheries should be expanded.

(See photo spread pages 64-66.)

RACH GIA: THE MARKET PLACE

Fig. 1 - Shrimp Sellers.

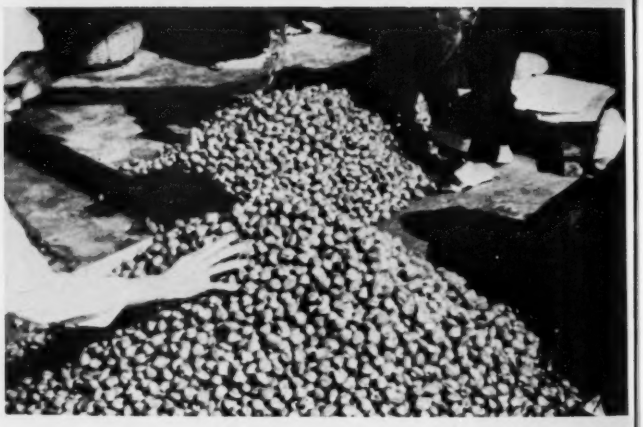


Fig. 2 - Clams for sale.

Fig. 3 - Red Snappers.

Fig. 4 - Preparing fish for Nouc Nam (fish sauce).

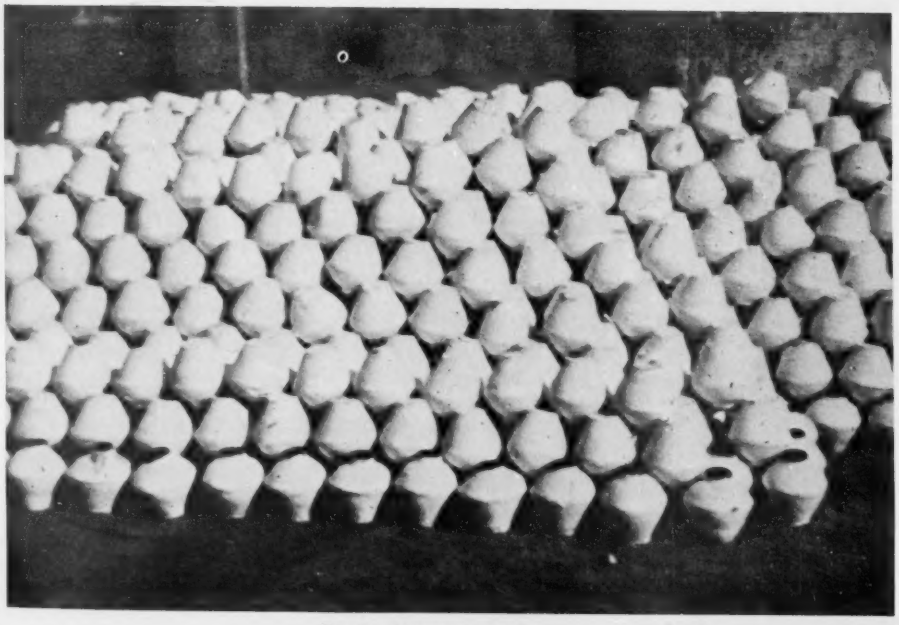


Fig. 5 - Clay jars for Nouc Nam.

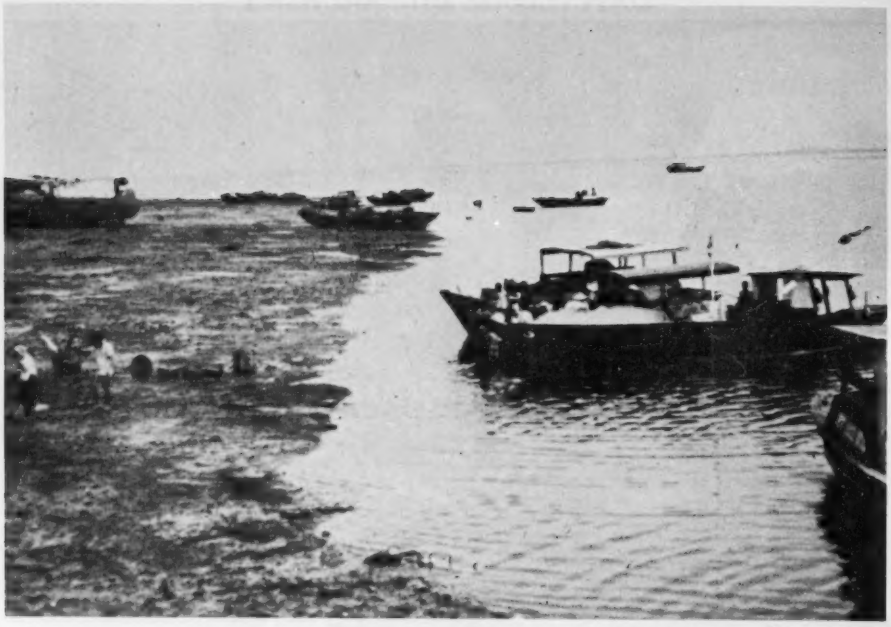


Fig. 6 - A Fishery Problem: Unloading fish by hand at low tide (Vung Tau).

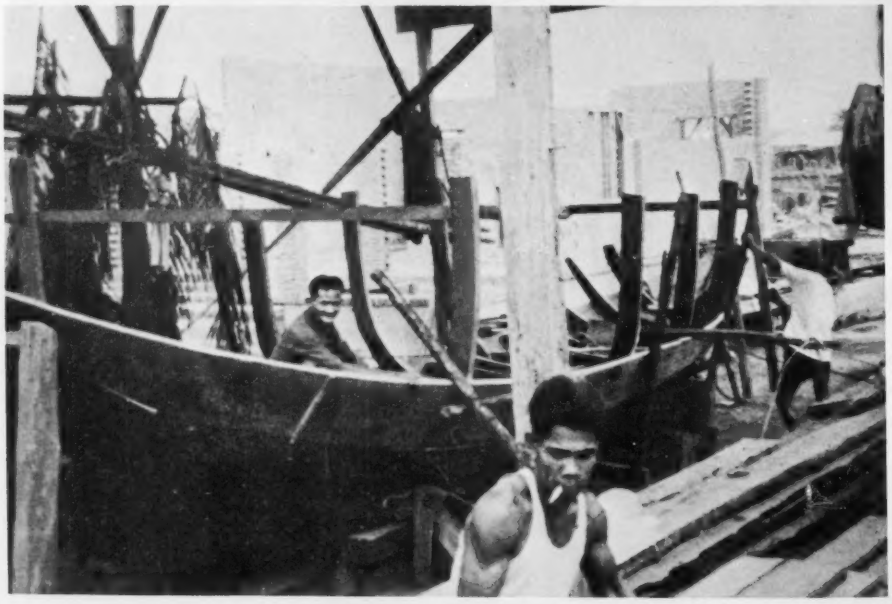


Fig. 7 - Typical construction methods for popular type of fishing boat (Phan Thiet).
(All Photos: Keith Brouillard)

ASIA

JAPAN

SUMMER ALBACORE TUNA FISHERY STARTS SLOWLY

The 1970 Japanese summer albacore tuna fishery has started much later than in normal years. This is due to the slow northward movement of the Kuroshio current.

Since early April, small, sporadic catches have been made off Japan. But most pole-and-line vessels hesitate to switch to albacore fishing; these are still concentrating on skipjack in more southerly waters, where fishing continues good.

Prices Up 20%

At the end of April, the price for summer albacore was quoted at exvessel US$655 a short ton--about 20% above last year's early season $544. Practically all landings were being bought by domestic tuna packers. ('Suisan Tsushin,' Apr. 28.)

* * *

ALBACORE TUNA BRINGS HIGH PRICES

About 20 metric tons of pole-caught albacore tuna landed in mid-April at Yaizu, Japan, sold for exvessel US$600-630 a short ton for fish 24-37 pounds each.

The albacore were caught off Bonin Islands, where about 20 live-bait boats were fishing. Some boats take 4-5 tons on good days. But fishing is generally poor because the albacore are too deep for pole-and-line fishing. ('Katsuo-maguro Tsushin,' Apr. 15.)

* * *

ALBACORE TUNA EXPORT PRICE SPIRALS

Japanese frozen round albacore prices for direct export to U.S., steady since 2nd-half 1969 were quoted at a high of f.o.b. US$630-645 a short ton. This is equivalent to about $675-690 a short ton, c. & f., U.S. west coast delivery.

Why Prices Spiral

Japanese trading firms attribute spiraling prices to poor U.S. albacore fishing in 1969, and to slow start of Atlantic fishery off Angola this year.

Japanese export prices for direct yellowfin (gilled & gutted) shipments to U.S. in mid-April were quoted at around $560 a short ton, c. & f. ('Suisancho Nippo,' Apr. 18.)

* * *

TUNA FISHERY VENTURE IN WEST INDIES IS STABLE

The Japanese cold-storage firm Nippon Reizo established a tuna base on Saint Martin Island, Netherlands Antilles (West Indies) in 1963. It now reports stable operations.

The enterprise is managed by Curacao Pioneering Co., which is capitalized at US$ 283,000, a local firm wholly owned by Nippon Reizo. It has a 1,000-ton-capacity cold storage and a 1,100-gross-ton freezership anchored offshore.

Buys From 15-20 Vessels

The base annually purchases from 15-20 longliners, operated mostly by South Korean and Taiwanese nationals, around 8,000 tons of tuna for export to U.S. During past several years, the Saint Martin venture has yielded annually a 5% dividend to stockholders. Of over 40 Japanese fishing firms abroad, it is one of 10 operating profitably. ('Suisan Tsushin,' Apr. 14.)

* * *

1969 EXPORTS OF MARINE PRODUCTS DROPPED 1.2% FROM 1968

In 1969, the value of Japanese marine-product exports was US$346,769,000--down 1.2% from 1968's $350,633,000. In 1967, these exports fell markedly (9.1%) for first time. However, exports in 1968 increased 7.5% over 1967.

Frozen-Fish Exports Fell

The 1969 decrease was due to decreases in frozen fish: yellowfin tuna down $9.94 million, other tuna down $1.05 million, and molluscs down $1.71 million, and canned products (salmon down $20.24 million, and crab). Decline in the exports of salmon and crab fell

JAPAN (Contd.):

Exports of Marine Products

	1969	1968	Percent 1969/1968
		US$1,000	
Fresh and frozen	85,999.6	90,703.3	94.7
Dried or salted	12,093.5	8,922.7	135.5
Canned and bottled	178,283.2	185,869.4	95.9
Aquatic oils and fats	5,068.8	3,806.6	133.1
Pearls	48,639.7	46,802.4	103.9
Kanten	4,480.1	4,816.8	91.5
Other	12,204.8	9,712.1	126.4
TOTAL	346,769.7	350,633.3	98.8

because international restrictions were strengthened. The decline resulted from strong domestic demand.

Dried or salted products, aquatic oil, and other marine products increased over 1968; pearls remained unchanged. ('Suisancho Nippo,' Mar. 5.)

* * *

U. S. TUNA IMPORTS DROPPED IN 1969

In 1969, the U.S. imported from Japan 156,245 short tons of fresh and frozen tuna. This included loins and discs but excluded tuna deliveries to American Samoa. It was somewhat less than in 1968, reports the Japan External Trade Organization.

Imports Down

Imports from Japan declined sharply from 1968. They totaled (1968 figures in parentheses): 75,544 tons (96,482 tons), consisting of albacore 43,068 tons (37,869 tons), other tuna 31,411 tons (54,991 tons), and loins and discs 1,065 tons (3,622 tons).

Why Decline

The decline in imports from Japan is attributed to: (1) reduced landings of albacore and other tuna by Japanese fleet; (2) vigorous tuna demand in Japan; and (3) sharply reduced Japanese tuna sales to U.S. because of numerous claims by U.S. packers for yellowfin shipments in late 1968.

U.S. Demand Up

Although shipments from Japan declined, the U.S. demand for imported tuna rose sharply in 1969. This pushed up prices for U.S. domestic catch and imports.

Albacore prices for imports from Japan rose from US$515 a short ton, c. & f., in January 1969 to $565 in June. It continued upward thereafter, reaching $625 a ton in January 1970. ('Suisan Tsushin,' Apr. 18.)

* * *

HAS 397,279 FISHING VESSELS

On Dec. 31, 1968, Japan had 397,379 fishing vessels totaling 2,415,420 gross tons (including fresh-water vessels), according to Fishing Vessel Section of Fisheries Agency. This is a decrease of 723 from 1967, but a rise in tonnage of 39,909 tons.

Type of Vessel	Number	Total Gross Tons
Powered vessels (subject to registration)	253,544	2,315,130
Nonpowered vessels over one ton (subject to registration)	11,426	20,931
Nonpowered vessels under one ton (exempt from registration)	132,309	79,359
TOTAL	397,279	2,415,420

During past 10 years, number and gross tonnage of powered fishing vessels increased. Nonpowered vessels decreased: in 1968, 40% in number and 50% in gross tons from 229,893 and 212,536 gross tons in 1958. Gross tonnage for powered fishing vessels exceeded that for nonpowered vessels in 1962, and the number was exceeded in 1964. ('Suisancho Nippo,' Mar. 4.)

* * *

REDUCES TRAWL OPERATIONS OFF U.S EAST COAST

In April 1970, only 6 Japanese vessels were off the U.S. east coast near New York; in early Dec. 1969, there had been 14, fishing primarily for squid. Eight had returned to Las Palmas, Canary Island, because squid dropped off and small, lean butterfish and deep-sea smelts increased in the catch.

The 6 trawlers were scheduled to leave the area around mid-May. Later, about 6 trawlers will return to fish herring from Aug. or Sept. until end of 1970. The 6 include the 'Sekishu Maru' (997 gross tons) which fished throughout 1969 off U.S. east coast.

Squid Catches

The Japanese squid catches off U.S. east coast since Dec. 1969 were estimated at

JAPAN (Contd.):

13,000 metric tons. These were sold to European countries at prices averaging around US$500 a metric ton for deliveries to Las Palmas.

Spain Plans Squid Fishing

Spain is the largest buyer of these Japanese-caught squid. Reportedly she plans sending trawlers to squid grounds off New York next season. Although scale of planned Spanish operation is not known, the Japanese feel increased squid production and possible marketing of inferior product will affect adversely their 1971 European sales. ('Suisan Tsushin,' April 15.)

* * *

FINDS BOTTOMFISH ABUNDANT OFF ARGENTINA

The Japanese government-operated research vessel 'Kaiyo Maru' (2,500 gross tons) recently conducted in Tokyo an exhibit and taste sampling of her trawl catches off Argentina in 50-1,120 meters. Her 45-day resource survey lasted from Dec. 10, 1969-Jan. 26, 1970.

Main Species Caught

About 42% of the catch was southern cod, 24% merluza (hake), 8% decora (phonetic), plus other bottomfish species.

Southern cod resemble pollock. They are delicious if cooked immediately, but become dry and unsuitable for home cooking if frozen very long.

Merluza are most abundant in shallow waters about 50 meters. Argentina annually harvests around 150,000 tons, 60% processed into fish meal, and some exported frozen to the U.S.

Decora are called merluza-decora in Argentina and are used in fish meal. They are good food fish. They were caught at 150-200 meters.

Region Offers Promise

The abundance of bottomfish off Argentina suggests that southwest Atlantic can be developed into productive fishing grounds for Japanese "surimi" (minced meat) factory-ship operations. ('Suisan Tsushin,' Apr. 15.)

* * *

TUNA LONGLINERS HAVE EXTRA LOW-TEMPERATURE FREEZERS

Two 314-gross-ton tuna longliners under construction at the Kanasashi and Miho Shipyards in Japan will have a freezing system capable of reducing temperatures to -60° C. (-76° F.). The vessels also will be equipped with four two-phase compressors capable of lowering the hold temperatures to -55° C. (-67° F.).

Construction cost of each vessel is about 185 million yen (US$514,000).

To Fish Bluefin Tuna

Scheduled for completion in mid-May 1970, the longliners will be sent to the South Pacific bluefin tuna grounds. ('Suisancho Nippo,' Mar. 30.)

* * *

PRICES STEADY FOR SQUID & OTHER W. AFRICAN TRAWL CATCHES

The Japanese market for "monko" squid and octopus taken off west Africa (near Spanish Sahara and Mauritania) is reported steady. Demand for large squid by restaurants continues strong.

The market for red sea bream caught off west Africa is weakening as spring demand tapers off.

Mid-April Prices

In mid-April, dockside prices (converted to US$/short ton) were: "Monko" squid: extra large (4-5 count 53-lb. box) and large (6-8 count: $1,512-1,522; medium (9-12 count) $1,469; small (13-20 count) $1,419; extra small (over 61 count) $630-781.

Octopus: extra large (1-3 count/53-lb. box) $474; large (4-5 count) $663; medium (6-7 count) $766; small (8-10 count) $713; extra small (over 41 count) $441.

JAPAN (Contd.):

Red sea bream: extra large (1-22 count 44-lb. box) $554; large (23-29 count) $580; medium (30-39 count) $605; medium-small (40-49 count) $554; extra small (70-99 count) $252. ('Suisan Tsushin,' Apr. 21.)

* * *

CANNED MACKEREL EXPORTS TO U.S. ARE INCREASING

Japanese canned mackerel exports to the U.S. are rising. Particularly sharp increases were noted in Feb. and March. Sales to one major U.S. west coast packer were over 70,000 cases (1-lb. talls, 48s) since Jan. 1970.

Trading firms are actively promoting their own brands in the U.S. If upward trend continues, canned mackerel exports to the U.S. in 1970 will approach one million cases. This would make U.S. a very important market, second to the Philippines.

1966 A Milestone

Exports to the U.S. first attracted attention in 1966, when poor mackerel fishing in California stimulated increased shipments from Japan that reached 450,000 cases. However, sales competition among Japanese trading firms later blunted U.S. buying interest; in 1967, sales plummeted to 180,000 cases.

The loss was regained gradually. Sales rose to 320,000 cases in 1968, and to 400,000 cases in 1969--approaching 1966 level.

Export Prices Up

Recent Japanese export prices for shipments to the U.S. are about 28 cents a case more than January 1970. They are reported around US$4.72 a case (48 1-lb. tall cans), exwarehouse, for natural pack. ('Suisan Tsushin,' Apr. 22.)

* * *

JAPAN & SOVIETS SIGN 1-YEAR CRAB AGREEMENT

Japan and the Soviet Union signed in Moscow on April 7 a 1-year crab agreement. The talks had begun on Feb. 9.

Under the agreement, the number of Japanese crab vessels and the 1970 season in the northwest Pacific are the same as last year, but the catch quota has been reduced somewhat.

A 15% reduction in Japanese king crab quota off western Kamchatka nullifies the long-term bilateral agreement concluded earlier whereby Japan was allotted a 216,000-case ($\frac{1}{2}$-lb. 48s) quota.

Fishing regulations by area for the Japanese fleet are (figures within parentheses are for 1969):

1. Off western Kamchatka: king crabs--183,000 cases (216,000 cases) by 4 fleets; "Ibara" crabs--765,000 crabs (900,000) by 2 fleets.

2. Western Bering Sea: tanner crabs--11.35 million crabs (13 million) by 42 vessels. Of that quantity, 2 million (6.5 million) to be taken off Cape Olyutorski and 9.35 million (6.5 million) east of Cape Navarin.

3. Off eastern Sakhalin Island: "Abura" (oil) crabs--600,000 crabs by 6 vessels, with a 10% allowance for mixed catches of king and tanner crabs; tanner crabs--17 million crabs (19 million) by 39 vessels.

4. Off Nijoiwa: 1.64 million "kegani" (hair) crabs by 14 vessels, same as 1969.

5. Triangle area: 600,000 king crabs, 1.3 million hair crabs and 910,000 "Hanasaki" king crabs by 37 vessels; same as 1969. ('Suisan Tsushin', Apr. 9, 'Minato Shimbun,' Apr. 8.)

* * *

BRAZIL'S 200-MILE SEA LIMIT MAY HURT JAPANESE FISHING

Brazil's extension of her territorial-sea limit from 12 to 200 miles on March 25, 1970, is expected to affect adversely Japanese shrimp and tuna longline fishing off that country. At present, 72 Japanese shrimp trawlers based in the Guianas harvest one-third of their catches off Brazil during March to September. In 1968, they took 1,888 metric tons of shrimp; in 1969, 2,501 tons.

Licensing for Foreigners Unknown

The Brazilian Government has not mentioned any licensing standards for foreign

JAPAN (Contd.):

vessels. If foreign vessels are excluded from the claimed waters, Japanese shrimp fishermen will suffer severely. The U.S. and other nationals also are shrimping off Brazil.

On April 6, the Japanese South American Shrimp Association petitioned the Fisheries Agency and the Foreign Office for help. The Foreign Office was reported planning to file a protest with Brazil. ('Minato Shimbun', Apr. 6.)

* * *

NORTH PACIFIC WHALE OIL SOLD

The sale of whale oil from the 1970 operation in the North Pacific, which began in May, has been contracted for export and domestic markets.

Export sales of 5,000-8,000 metric tons of fin-whale oil were contracted at US$230 a metric ton, c.i.f., delivery Rotterdam; 4,000 tons of sperm-whale oil at $262 a ton, delivery Rotterdam and New York City. All fin-whale oil exports are to European users, such as Unilever. U.S. firms bought 3,000 tons of sperm-whale oil.

Japanese Market

Sales of sperm-whale oil to Japanese domestic firms were at $258 a ton, but actual price comes to $269 when payment conditions are included. Sales of fin-whale oil to Japanese firms were expected to be concluded shortly after mid-April. ('Suisan Tsushin,' Apr. 11 & 16.)

TAIWAN

1969 CATCH ROSE 5.6%

Taiwan's 1969 catch of 560,783 metric tons was 5.6% above 1968. Production from fish culture increased only 0.8% due to typhoon flooding summer 1969, which caused heavy losses in fish pounds.

The 1970 target is 632,000 tons, which may be considered optimistic. In 1969, only 23,000 tons of fishing vessels were constructed; the goal was about 33,000 gross tons. The number of vessels operating in 1970 will be smaller than planned; it will be difficult to reach goal.

Exports Up

Fishery exports were US$44,700,000 in 1969. This figure differs from US$12 million figure of Foreign Trade Bureau, Republic of China. The latter includes only exports from Taiwan, and not exports from overseas ports; these were US$32,000,000, a large increase over 1968.

Artificial Spawning

The experiment in artificial propagation of grey mullet at Tungkang was a complete success. On Feb. 5, 90 fingerlings, 42 days old, still survived from thousands used. The average length reached 3 cm. They were planted at this size in fish ponds to grow to adulthood. This is result of 5 years of experiments. In 1969, only 2 fingerlings survived; they were 30 days old and measured 1.1 cm.

Another batch of about 300 fingerlings, each about 2 cm. long, is still in rearing ponds at Tungkang. What remains to be done is refinement of technique to produce fingerlings on a large scale to supply fish farmers.

World Bank Loans

The World Bank has made 2 loans: The first, in 1963, was US$7.8 million for three 1,000-ton boats and thirteen 300-ton tuna longliners. The construction was awarded to a Japanese shipyard after world-wide bidding. Construction was completed in 1965.

A second loan of US$7 million was made in 1968 to build twenty 250-ton vessels. The construction was awarded to a Korean shipyard. Work began in Dec. 1968. Due to reorganization and strikes, construction was not completed until early 1970. Nineteen vessels have been delivered to Taiwan; one is being refitted in Japan.

Asian Development Bank

A loan of US$10 million was approved to build forty 250-ton tuna vessels. Applications for only 35 boats were received by Taiwan Fisheries Bureau. Many applicants intend to withdraw. Each will forfeit a deposit of NT$250,000 (US$6,300). (T. P. Chen, Chief, Fisheries Division, Joint Commission on Rural Reconstruction.)

CANADA

MAY DEVELOP NEW TRAWL FISHERY IN W. LAKE ONTARIO

Canada may establish a profitable trawl fishery for smelt and alewives in Lake Ontario's western end. The new fishery would not interfere with present fishing operations.

The Lake Erie trawler "Leona Charles," chartered by provincial government, made consistently good catches during past winter off Toronto and Hamilton: individual half-hour hauls up to 8 tons.

For Humans & Animals

The catches provide large smelt for human consumption, small smelt for mink feed, and alewives for processing into petfood. Sorting is done by hand. It is hoped that mechanical sorters, which now grade by size, can be modified to separate species. This would reduce labor costs and prevent much tedious work.

Gill Nets Safe

Lake Ontario's traditional gill-net fishery is carried out only in the lake's eastern end, so there will be no danger of bottom trawls damaging the delicate gill nets.

Smelt have been popular for many years, but Lake Ontario alewives have had no commercial value, although they contribute to diet of more valuable fish species. In many resort areas of Lake Ontario, they have been considered a nuisance because there is usually a summer "die-off". Vast numbers of dead alewives are washed onto the beaches. ('Canadian Dept. of Fisheries and Forestry', Apr. 23.)

* * *

IMPORTS OF CANNED TUNA UP, FROZEN TUNA DOWN

In 1969, Canadian canned-tuna imports were 3,834 short tons worth US$3,957,000. This was rise of 4% in quantity and 19% in value above 1968, according to Japan External Trade Promotion Organization.

Purchases from Japan were 3,116 tons, over 80% of Canada's canned-tuna imports. These were mostly canned white-meat tuna packed under buyer's label, although imports of solid and chunk light-meat tuna packs have been increasing lately.

Cuba Exports to Canada

Cuba also exports canned white meat and some canned light-meat tuna to Canada. Cuba may become a greater supplier because her product is lower priced, and quality is improving under technical assistance.

Prices Rising

Canned tuna prices in Canada generally are rising. For Japanese canned solid white meat tuna, retail prices for 7-oz. can range from 43-47 Canadian cents (39-41 cents in 1968) to 52-57 cents (45-48 cents in 1968). The 13-oz. solid white meat tuna are being sold for $1.05 a can. The Cuban 7-oz. can retails for 29 cents a can for both solid white and solid light meat tuna.

Frozen Tuna Imports

In 1969, Canada's frozen tuna imports were 1,793 short tons worth $801,000, a sharp drop from 1968's 5,201 tons worth $2,426,000. Shipments from Japan are 90% of imports. These have remained fairly stable during past two years. Purchases from Cuba have dipped sharply, and Mauritius Island and Malaysia, important suppliers in earlier years, sold none.

2 Major Canneries

Canada has two major tuna canneries packing mostly albacore, which is in great demand. However, albacore fishery is poor, so those packers face a lack of raw material. Since 1968, they have sought supplies abroad. ('Suisan Tsushin,' Apr. 20.)

EUROPE

NORWAY

FISHING INDUSTRY WAS PROSPEROUS IN 1969

On the average, 1969 was a prosperous year for the Norwegian fishing industry. Although total landings fell 15% to 2.2 million metric tons exvessel value reached US$147 million (up .%) and export earnings $237 million (up 7.2%).

Why Value Rose

The 1969 increases in value reflected the compound effect of 2 factors: generally higher product prices, and the processing of an increased proportion of the catch into higher-priced products. These were more frozen fish fillets, canned fish, and klippfish; less fish meal and oil.

Cod Up, Herring Down

The cod fisheries yielded 274,000 tons, the second highest recorded. The pattern of supply of raw fish for the reduction industry was drastically altered in 1969. Landings of herring dropped more than 500,000 from 1968--to only 205,000 tons--because of the almost-complete failures of winter herring and fat herring fisheries; North Sea herring landings fell over 50%.

Fish Reduction Down 20%

The fish reduction industry processed 1.6 million tons of fish--20% less than in 1968. It used mainly other species of densely shoaling fish: mackerel, capelin, and Norway pout.

State Support Steady

State support to the fisheries, including purchases of stockfish from producers/exporters, was $37 million, practically the 1968 level. (U.S. Embassy, Oslo, May 6.)

* * *

BULK CARRIER TO BECOME FISH-MEAL FACTORYSHIP

A former Swedish bulk carrier purchased by Norglobal A/S, Tromsø, Norway, will be reconstructed into a floating fish-meal factory at Nyland Shipyard in Oslo. The vessel is 584 feet long, 78 wide, and 45 feet deep. She is registered at 18,362 gross tons and 26,100 tons deadweight. The factoryship is expected to be ready by July. The first expedition will be off Africa.

Process 3,000 Tons Daily

A/S Myrens Verksted in Bergen, Norway, will deliver factory machinery designed to process daily about 3,000 tons of raw material--equal to 600 metric tons of fish meal. The raw material will be delivered from 12-15 modern purse seiners. The expedition will accommodate 200 men. The project is an investment of about US$14 million.

3 Production Lines

The ship will have 3 fish-meal production lines. Greatest automation and maximum space use were stressed. The ship will be equipped with 4 positions to load raw material from vessels at total capacity of 800 tons an hour.

The raw material will run past fully automatic scales that register net raw material received. The raw-material bins are self-trimming, with facilities steered from deck to empty raw material.

The transport systems contain regulated feeding apparatus leading raw material to 4 indirect boilers, then past strainer facilities to 3 double-screw presses. The boilers have variable speed to make maximum use of raw materials. The drying plants to process meal are specially constructed for ship installation.

Storage for 2 Days' Work

After first grinding process, meal is run through a pellet plant and transported to storage tanks. Pellets can be discharged directly to transport vessels at sea. The oil separator plant and liquid presses operate automatically. At full production, the ship has a raw-material storage capacity for 2 days' operation; she can store about 10,000 tons of pellets, and about 5,000 tons of fish oil. ('Fiskets Gang,' Mar. 12.)

DENMARK

SALMON BOAT CONVERTED TO SHRIMP FACTORYSHIP

A former salmon trawler, the 'Greenland', is being reconstructed in Esbjerg, Denmark, into a floating shrimp factory, the first of its kind in the world. The ship originally was purchased in Cuxhaven by Director Sørensen of Esbjerg. She underwent extensive reconstruction for salmon operations off Greenland.

Fishing off Greenland was satisfactory, but Sørensen decided there were too many vessels in the area and that the vessel could be used to explore other N. Atlantic riches.

The Greenland still will be able to perform as a salmon vessel.

U.S. Shrimp-Peeling Machine

She will be equipped with a U.S. shrimp-peeling machine. The machine is capable of peeling 6 tons of shrimp in 20 hours. Normally, shrimp are peeled by Greenlandic women, who can peel 3 kilograms of whole, raw shrimp in one hour. The new machine can peel as much as 100 women peel during a normal workday.

A factory expert will oversee the new machinery. After peeling, the shrimp will be frozen onboard. Further processing--to boil and pack the shrimp--will take place in Denmark.

Ice Masses Delay Season

Assuming timely receipt of the machinery from the U.S., the Greenland was scheduled to begin operations about May 1. The shrimp season normally begins in May. However, due to large ice masses in Disko Bay, where the vessel will operate, the season has been delayed. ('Vestkysten,' Apr. 9.)

FRANCE

IMPORTED MANY JAPANESE FISHERY PRODUCTS IN 1969

French imports of Japanese fishery products in 1969 have been reported by the Japan External Trade Organization:

Frozen Tuna: 995 metric tons (922 tons in 1968). The Japanese product was nearly 80% of total French imports in 1969, which amounted to 1,197 tons (2,439 tons in 1968).

Canned Salmon: 794 metric tons, over 50% of French canned-salmon imports of 1,330 tons. Purchases from Japan in 1969 declined 50% from 1968. The Soviet Union has increased its canned salmon sales to France since 1968. In 1969, these surpassed (in volume and value) shipments from Canada, Japan's former chief competitor in France.

Japanese Shipments Fall

Canned Crab and Shrimp: Bought 852 metric tons from Japan, mostly canned king crab. Compared with 1968, shipments from Japan declined 50% in quantity but rose 20% in value; this reflected sharp rise in price. However, high price has sharply reduced retail sales in France. It is feared market for Japanese product may collapse.

Canned Mackerel: Imports from Japan were 253 metric tons, down slightly from 1968. ('Suisan Tsushin,' Apr. 21.)

USSR

SOVIET CANNED KING CRAB IN JAPAN

Canned king crab packed in the Soviet Union began to appear in Japan in late Feb. 1970. The product was imported by Tokyo Maruichi Shoji, a leading importer of Soviet marine products. It is being sold in various parts of Japan under Soviet labels 'Chatka' and 'Ako'.

One leading Tokyo department store is selling Chatka, a quality pack, for US$1.94 a can ($\frac{1}{2}$-pound pack), the same price as that for Japanese factoryship production. Some supermarkets are promoting sales at low prices of $1.33-1.38 a can.

Also Soviet Competition Elsewhere

Apparently, the Soviets are exploiting opportunity provided by Expo-70 to penetrate Japanese market. Japanese packers, who face Soviet competition in the U.S., France, and elsewhere, now are confronted with an aggressive sales offensive in Japan. Hereafter, market prices will be largely influenced by the movement of the Soviet product. ('Suisab Tsushin,' Apr. 13.)

SOUTH PACIFIC

AUSTRALIA

CONTINENTAL SHELF ACT BECAME EFFECTIVE APRIL 15

Australia's Continental Shelf (Living Natural Resources) Act of 1968 became effective April 15, 1970. J. D. Anthony, Minister for Primary Industries, said Australia was extending her control over the living natural resources of the Continental Shelf in accordance with international law.

He noted that the Pearl Fisheries Act in the early 1950s had helped develop international law in this field. However, it applied only to pearl shell and three other marine organisms.

The Act of 1968 relates to Continental Shelf living natural resources as defined in 1958 Convention.

What Act Covers

The Act applies to marine organisms including many sedentary species, such as corals, sea anemones, sea pens, sponges, sea urchins, beche-de-mer, sea lilies (have scientific not commercial value); molluscs, including mother-of-pearl, giant clams, oysters, mussels, and other bivalves, abalone, trochus, green snail, and other similar gastropod molluscs, chitons, and seaweeds.

This list could be extended later, in accordance with conservation needs, to include other living natural resources covered by the Convention.

Also Covers Foreign Nationals

Mr. Anthony said the Act applied also to foreign nationals. After April 15, 1970, it became an offense to take these organisms without a license from specified parts of the Continental Shelf and the External Territories. The Government intends that the resources be protected particularly from foreign fishermen. They will be prevented from taking clams or other specified organisms from the shelf near the Great Barrier Reef.

Licensing

The Government did not intend that foreign fishing vessels be licensed. Australian fishermen and vessels must be licensed if they fish for these organisms for commercial purposes. Tourists and other noncommercial persons would not need licenses. However, they would have to obey management rules (closed seasons or minimum sizes) that may be introduced.

The Government is considering a complete ban on taking certain molluscs near the Great Barrier Reef.

Stiff Penalties

The Act provides stiff penalties for unlicensed commercial taking of sedentary organisms: from fines up to $1,000 and, at Court's discretion, forfeiture of the vessel, equipment, and sedentary organisms taken illegally. Additional penalties are provided for offenses by foreigners. ('Australian Fisheries,' Mar. 1970.)

* * *

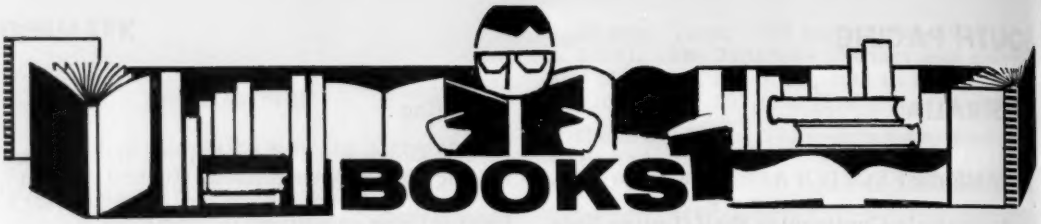
NEW SHRIMP PROJECT ANNOUNCED

The Australian Cabinet last year approved funds for shrimp explorations from New South Wales-Queensland border around Australia's northern coasts; then, up into Gulf of Papua and down to latitude 19° S. in W. Australia.

J. S. Hynd, a marine biologist, was appointed project leader. B.V. Hamon, a senior physical oceanographer, is organizing oceanographic and environmental aspects. The project is centered at Cronulla, New South Wales; there are several field laboratories.

The Program

The first part is concerned with shrimp stocks, the second with relations between those stocks and their environment. The third part, not yet undertaken, aims to develop gear. ('Australian Fisheries,' Mar. 1970.)



MARINE SCIENCE

"Marine Science Affairs--Selecting Priority Programs." Annual Report of the President to the Congress on Marine Resources and Engineering Development, 284 pp., April 1970. Can be obtained from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. $1.50.

Enactment of Marine Resources and Engineering Development Act of June 17, 1966, increased Federal attention to marine science affairs. In accordance with Act's provisions, the President reports to Congress each year "on the state of the Nation's marine sciences programs, describing the activities and accomplishments of the Federal departments and agencies, evaluating these accomplishments, and setting forth recommendations as to future policies, programs, and funding."

During 1969, the Marine Sciences Council moved from identification of "critical Government-wide marine science issues" to development of priority program to meet U.S. needs. The Report presents these priorities:

--A U.S. policy and grants to encourage States to improve planning and managing of their coastal areas.

--Marine research that is "essential to wise use" of the coastal environment.

--Lake-restoration programs to restore quality of "seriously damaged national waters, including the Great Lakes."

--Arctic environmental research "to permit fuller rational use of the Arctic region."

--The International Decade of Ocean Exploration. This is "a cooperative program with coordinated research, surveys and data sharing leading to mutually beneficial understanding of the world ocean."

--Expansion of program to develop oceanographic and atmospheric buoys for productive use by several agancies in a broad program.

--Research and development to cut operating costs of merchant ships.

AQUICULTURE

'Marine Aquiculture,' edited by William J. McNeil. Selected papers from Conference on Marine Aquiculture, Newport, Oregon, May 23, 24, 1968. Corvallis: Oregon State University Press, 1970, 172 pages, $6.

The book describes the hopes for increasing the yield of cultured marine organisms and the obstacles to achieving this. Ten scientists summarize research in fish nutrition, genetics, and other subjects.

Roy A. Young discusses the projected need for food in the "future overpopulated world." He concentrates on the role controlled populations of marine fish and shellfish might play in meeting this need. James E. Shelbourne reports the progress in marine fish cultivation in Britain. He notes the long period of preliminary work needed to establish hatching and rearing facilities for sole and plaice. But he shows that the results have been encouraging.

Energy costs and nutrition--basic to any aquiculture that progresses beyond the empirical stage--are treated in separate articles by J.R. Brett and J.E. Halver. R.C. Simon emphasizes the opportunities to apply genetic principles to improve cultured stocks. L.R. Donaldson discloses the results of years of selective breeding of trout and salmon. He shows the relatively quick responses that can be obtained in growth and fecundity.

Technology can have an impact on aquiculture. The impact can be accidental--through use or change of resources vital to aquiculture--or can be planned into the culture operations. There are articles on fisheries engineering by Milo Bell and on thermal enrichment by T. A. Gaucher.

The contribution by C.J. Sindermann on diseases in marine aquiculture "raises a flag of warning." Gathering marine animals in concentrations necessary for intensive culture often has resulted in outbreaks of disease. He notes necessity of learning as much as possible about the pathogens.

In "Economic Obstacles to Marine Development," Anthony Scott indicates lack of demand for aquiculture products except luxury items and common carp. He outlines conditions for successful aquiculture operation.

The book is an introduction to marine aquiculture that often probes deeper than introductory phase. The literature cited at the end of each article is useful.

SCIENTIST'S WATERY WORLD

Three paperbacks discussing oceanography and ocean charting now are available, reports the books' sponsor, the U. S. Naval Oceanographic Office (NOO):

1. "Science and the Sea, Vol. II" ($1)

2. "Spheroidal Geodesics, Reference System and Local Geometry" ($1.75)

3. "The Water Planet" ($1)

Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

1. "Science and the Sea" has 10 articles: a chapter on distribution of discolored waters--how concentrated forms of marine life change oceans from green or blue to brown, red, and yellow. A chapter on geological oceanography deals with undersea rock and sediment structuring. One entitled "Navigational Hints" features information on piloting boats and ships. Another, "Survival at Sea," tells what to do in a mishap. "Collisions--1969" discusses four ship accidents.

Except for chapter on energy of ocean waves, the book was written by NOO personnel.

2. "Spheroidal Geodesics" would appeal primarily to navigators, mathematicians, and geographers. Geodetics is science of correctly locating objects, including islands and ships, on world's spheroidal surface. Book was written by P. D. Thomas, staff mathematician.

3. "The Water Planet" describes what oceanographers and surveyors do at sea and in their land-based laboratories. Written and edited for NOO as recruitment publication, it has many illustrations.

It is aimed primarily at students and describes scientists' efforts to learn more about the ocean's physical nature--its geology, chemistry, physics, and biology--in a brief, easy-to-understand style.

The book features an illustrated description of efforts by marine biologists to learn how certain species or marine animals use nature-provided sonar systems either to communicate with each other or to locate food in dark waters. It has information on sea floor geology: how ocean surveyors explore invisible rock structures, many covered by water and concealed by sediment mud. It looks into ocean chemistry through a short, illustrated paragraph on the wide variety of minerals that can be found in a cubic mile of ocean water.

It describes ocean-related careers--for example, how engineering techniques have put the scientist in the sea. It tells how to get started in an oceanographic career.

FPC BIBLIOGRAPHY

All references to fish protein concentrate (FPC) research for the last 30 years have been compiled in a bibliography by the Library of Congress. The bibliography, sponsored by the BCF National Center for Fish Protein Concentrate, contains 300 abstracted references.

It can be obtained from Clearing House for Federal Scientific and Technical Information, Sills Bldg., 5285 Port Royal Rd., Springfield, Va., 22151, for $3. A second bibliography covering fishmeal will follow.

LAW OF SEA

"The Law of the Sea." National Policy Recommendations. Proceedings of the Fourth Annual Conference of the Law of the Sea Institute, June 23-June 26, 1969. The University of Rhode Island, Kingston, R.I. Edited by Lewis M. Alexander, 533 pages, mimeographed. Available from the Institute for $7.50.

The book contains the following papers and panel discussions:

- 'Our Nation and the Sea: A comment on the Proposed Legal-Political Framework for the Development of Submarine Mineral Resources,' by E.D. Brown

Regimes of the Deep-Seabed

- 'The Oceans and Foreign Policy: Laissez-Faire or a Stronger National Purpose?' by Victor Basiuk
- 'The Marine Commission's Deep-Seabed Proposals--A Political Analysis,' by Robert L. Friedheim
- 'Oil Interests in the Deep-Seabed,' by Thomas F. Gaskell
- 'Proposed Regimes for Exploration and Exploitation of the Deep-Seabed,' by George Miron
- 'Some Thoughts on an International Regime and Administrating Agency for the Seabed and Ocean Floor Beyond the Limits of National Jurisdiction,' by W. Langeraar

The Continental Shelf. Considerations of the Marine Science Commission Recommendations.

- 'Recommendations on the Limits of the Continental Shelf and Related Matters,' by Ian Brownlie
- 'Limits of National Jurisdiction Over Natural Resources of the Ocean Bottom,' by Hollis D. Hedberg

Regimes of the Continental Shelf

- 'Some Dimensions of Defense Interest in The Legal Delimitations of the Continental Shelf,' by Norman V. Brechner
- 'The Continental Shelf and the Public Interest,' by Thomas A. Clingan Jr.
- 'An Oceanographer's View of the Law of the Sea,' by K.O. Emery
- 'International and Domestic Managerial Regimes for Coastal, Continental Shelf and Deep-Ocean Mining Activities,' by L.F.E. Goldie
- 'The Seaward Limit of the Continental Shelf,' by Roger Denorme

International Fisheries: Consideration of the Marine Science Commission Recommendations

- 'Marine Science Commission Recommendations on International Fisheries Organizations,' by J.L. Kask
- 'Critique: Fisheries Management Provisions in the Commission Report,' by P.A. Larkin

International Fisheries Regimes

- 'International Fishery Regimes,' by Donald L. McKernan

Science and International Organization

- 'Freedom of Scientific Inquiry,' by William L. Sullivan Jr.
- 'International Organizations for Marine Science--An Eclectic Model,' by Daniel S. Cheever
- 'Report on Jurisdictional, Administrative, and Technical Problems Related to the Establishment of California and Other State Coastal and Offshore Boundaries,' by F.J. Hortig

Ocean Strategy for U.S.

- 'The Ocean Regime of the Real World,' by Wilbert M. Chapman

Contributed Papers

- 'A Framework Towards a Seabed Regime,' by L.R. Heselton Jr.
- 'The United States, Chile, Ecuador and Peru: Some Reflections on the 1969 Report of the Commission on Marine Science, Engineering and Resources, by Thomas Wolff
- 'The Malta Plan and the United Nations,' by Eugene Brooks
- 'Applications of Mathematical Economics in Marine Resources Research,' by Clifford S. Russell

THE FOLLOWING PUBLICATIONS OF THE DEPARTMENT OF INTERIOR, FISH & WILDLIFE SERVICE, ARE AVAILABLE FROM DIVISION OF PUBLICATIONS, BCF, 1801 N. MOORE ST., ARLINGTON, VIRGINIA 22209:

LAKE ERIE

"A Brief History of Commercial Fishing in Lake Erie," by V.C. Applegate and H.D. Van Meter, Fishery Leaflet 630, pp. 1-27, April 1970.

"Salient features of the development of the industry from about 1815 to 1968, changes in fishing gears and methods, changes in the kinds and abundance of fishes caught, and the attendant effects of disappearing species on the stability of the fishery are described. The history and present status of the walleye, yellow perch, and eight other fishes, still taken in commercial quantities, are presented in more detail and are considered in the context of their effect on the current moribund state of the U.S. fishery. Past and present contributions of Lake Erie's tributaries and northerly connecting waters to the fishery are outlined briefly. The 'outlook' for the fishery under present conditions of selective overfishing for high-value species, excessive pollution, ineffective and uncoordinated regulation, and antiquated methods of handling, processing, and marketing fish are discussed, and possible solutions to these problems are suggested."

MOTION PICTURES

'Fishery Motion Pictures,' Fishery Leaflet 629, pp. 1-28, May 1970. Leaflet lists commercial fishery motion pictures produced and distributed by BCF. It tells how to borrow prints without charge (except return postage).

BCF films provide conservation education, consumer information, and technical training. Each year millions of persons see the films in classrooms, on TV, in civic and religious programs, at sportsmen's meetings. The films also stimulate demand for U.S.-produced fishery products.

FWS PUBLICATIONS

Fishery Leaflet Nos. 597 and 628 are listings of available fishery bulletins of the U.S. Fish and Wildlife Service.

Fishery Bulletins are technical reports on scientific investigations of fishery biology.

SCREENING FISH

"Diversion and Collection of Juvenile Fish with Traveling Screens," by Daniel W. Bates, Fishery Leaflet 633, pp. 1-6, March 1970.

"A horizontal traveling screen, suitable for screening fish or debris from powerplant water intakes or irrigation diversions, was designed and operated by the Bureau of Commercial Fisheries during 1965-69. The structure consisted of a vertically hung, endless belt of wire-cloth screen panels, flush with the face of the water intake structure or at an angle to the direction of flow.

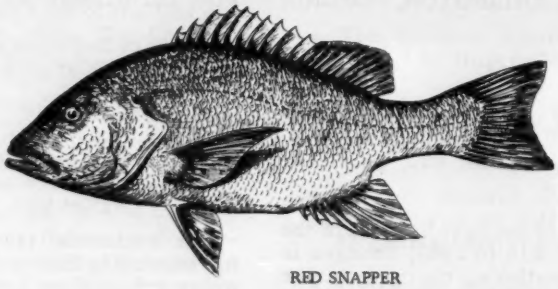
"Field tests in different water approach velocities, with the screen traveling at various rates, proved that such a facility can be operated efficiently. The horizontal traveling screen . . . should contribute materially to the development of an efficient, relatively low-cost diversion facility for fish and debris."

Mr. Bates states that biologists and engineers have been trying for many years to develop an efficient method to safeguard juvenile fish exposed to hydroelectric or irrigation developments in rivers. They studied the possibility of deflecting these migrating fish from their normal paths to alternate routes. Numerous methods were examined: bands of rising bubbles, curtains of hanging chains, electrical stimuli, lights, louvers, sound, and water jets. These methods were never completely reliable.

In 1965, a new approach promised to overcome disadvantages of fish-guiding or deflection devices. Development of the horizontal traveling screen provided many practical solutions to the problems of fish diversion. The leaflet lists its advantages.

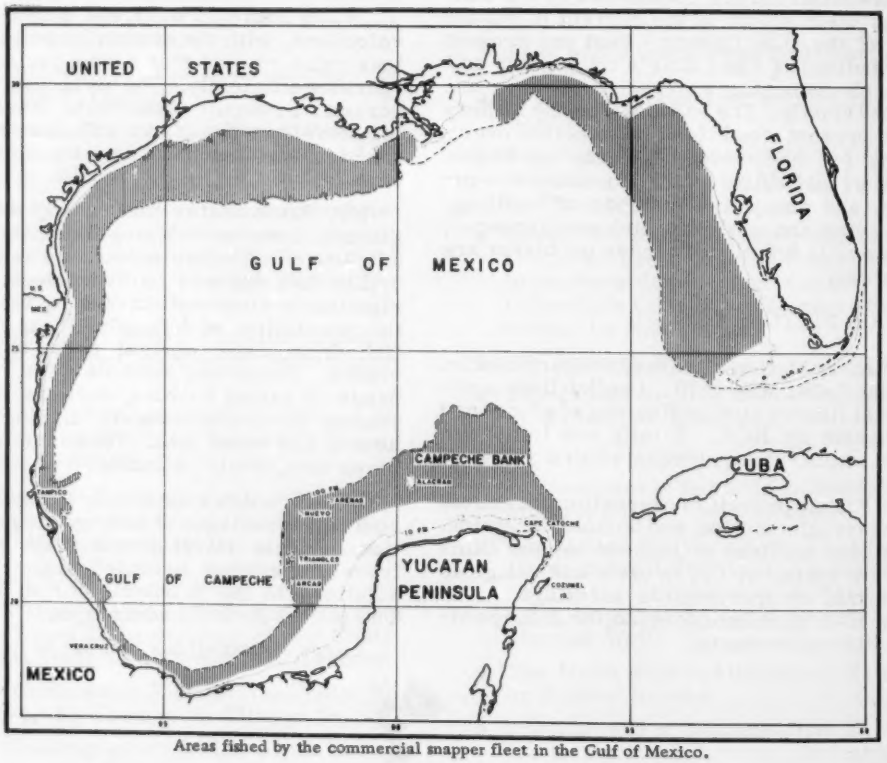
Large illustrations tell the brief story.

FOOD FISH FACTS



RED SNAPPER

The red snapper is one of the most delicious deep sea delicacies on the market. Most are caught in the Gulf of Mexico and landed in Florida where the red snapper industry is centered. Many modern fishing vessels range more than 400 miles from home, to the coasts of Yucatan and Honduras, for their catches.



Areas fished by the commercial snapper fleet in the Gulf of Mexico.

(Continued following page)

DESCRIPTION

The red snapper, as its name implies, is brilliant red in color and is one of the most colorful fish in a seafood market display case. It ranges in size up to 30 pounds in weight and $2\frac{1}{2}$ feet in length.

HABITAT

Although very little is known about the life history of the red snapper, commercial fishermen have learned that concentrations of snapper are usually found over certain types of bottom. Irregular hard bottom formations of rock and limestone covered with live coral and grass, called lumps or gullies, are especially preferred by snapper. Fish schools are usually located several feet off the bottom of these areas, where food material brought in by eddying currents settles out. Fishermen believe that the red snapper stays in shallow water during the summer months and moves offshore again as fall arrives. It is believed that the snappers spawn in deep water during the fall.

SNAPPER FISHING

Snappers are taken in water several hundred feet deep, and most of the catch is still made with hook and line. For several years, however, fishery research vessels operating out of BCF's Exploratory Fishing and Gear Research Base in Pascagoula, Mississippi, have sought to develop new and better fishing methods to improve the effectiveness of the fishing fleet. The Research Base is testing the effectiveness of a modified otter trawl, a large, flattened, cone-shaped net of nylon which is dragged along the ocean floor.

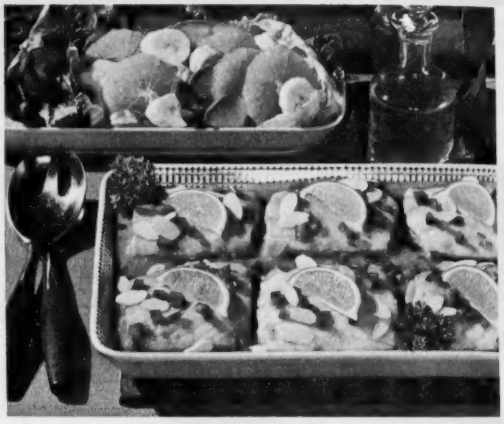
Improvements in electronic gear have also helped the fishermen. In early years fishermen relied almost entirely on trial and error navigation to locate fishing grounds. Hard bottom areas were often difficult to locate, and many hours were spent searching. As early as 1953, BCF tested a fish finder which utilized electronics to show the bottom composition and fish present under the boat. Today, depth sounding devices and fish finders are being used with great success in the fishery. One of these recorders graphically portrays the seabed, its consistency, and the fish concentrations on or above the bottom. With this instrument fishermen can locate gullies and lumps and actually distinguish between hard and soft bottoms. Fishermen have little difficulty in locating and staying over fishable bottoms.

USE OF RED SNAPPER

Red snapper is available year round in all parts of the country. Its meat is juicy, white, and of fine flavor. Red snapper is sold in several market forms including fresh dressed, fresh fillets, frozen fillets, and frozen portions. It can be served broiled, baked, steamed, or boiled in a host of imaginative ways which add even more appeal to this deep sea delicacy.

SNAPPER IS DAPPER WITH A SIMPLE SAUCE

Although we cherish the old, tried and true recipes that have won acclaim over the years, it's exciting when we discover something utterly new and different. Why not be adventuresome and soar into the 1970s with some bright new ideas for preparing seafoods? BCF has thoroughly tested and found delicious a totally new approach to preparing everyone's favorite seafood, red snapper. In this recipe, Dapper Snapper, the snapper is baked in a quick and easy sauce that is made from gravy mix, of all things! The sauce is highlighted with a tang of lemon, and a lively base of chopped onion placed under the fillets further accents the taste. Just 20 to 25 minutes in the oven is all the time needed to flake the fish and blend the flavors, and this imaginative entree is ready to garnish with almonds and green pepper bits and serve.



Red snapper has long been considered one of the most delicious deep-sea delicacies on the market. Its brilliant coloring and attractive appearance is only exceeded by the juicy, white, fine-flavored flesh. Most of the snapper on the market is caught in the Gulf of Mexico and landed in Florida. Because of today's fast, modern transportation, this delicacy is available in most areas of the United States.

It is sold in several market forms including fresh dressed, fresh fillets, frozen fillets, and frozen portions. Red snapper's tender, delicate flesh adapts readily to a host of imaginative preparation methods and is equally good broiled, baked or poached. Dapper Snapper offers a new flavor sensation that we think you'll like; why not try it today!

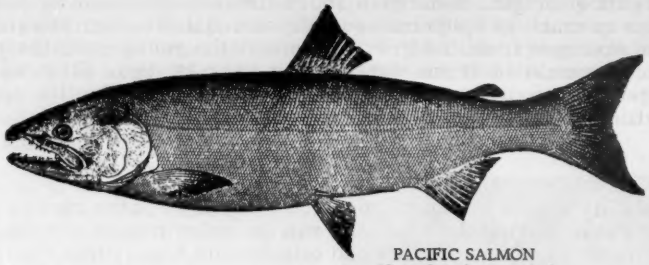
Many other exciting ways to prepare Florida's deep-sea bounty are contained in a colorful booklet, Florida Fish Recipes. Red Snapper Floridian, Spicy Red Snapper, and Baked Red Snapper With Sour Cream Stuffing are just a few; this booklet also has many tasty ideas for mackerel, shrimp, lobster, crab, oysters, catfish, grouper, and mullet. For your copy, send 35¢ to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, and ask for Florida Fish Recipes (I 49.49/2:1).

DAPPER SNAPPER

2 pounds snapper fillets or other fish fillets, fresh or frozen
$\frac{1}{4}$ cup chopped onion
1 package ($\frac{5}{8}$ to $\frac{7}{8}$ ounce) brown gravy mix
1 tablespoon olive oil
1 teaspoon lemon juice
1 teaspoon salt
Dash pepper
$\frac{1}{4}$ cup sliced almonds
$\frac{1}{4}$ cup chopped green pepper

Thaw frozen fillets. Skin fillets. Cut fillets into 6 portions. Sprinkle onion in a well-greased dish, 13 by 9 by 2 inches. Place fish, skinned side down, on onion. Prepare brown gravy mix according to package directions. Add oil, lemon juice, salt, and pepper. Pour gravy over fish. Bake in a moderate oven, 350° F., for 20 to 25 minutes or until fish flake easily when tested with a fork. Garnish with almonds and green pepper. Makes 6 servings. (National Marketing Service Office, BCF, U.S. Department of the Interior, 100 East Ohio Street, Room 526, Chicago, Illinois 60611.)

FOOD FISH FACTS



PACIFIC SALMON
(Oncorhynchus species)

Salmon has nourished the human race since ancient times. Pliny, the Roman scholar, wrote in 77 A.D. that "the river salmon is preferred to all fish that swim the sea." Salmo is still preferred by many people today. The fact that canned salmon is 100 percent edible, easy to store and use, as well as being high in nutritional values, makes it one of the most can-venient items on the market.

DESCRIPTION

There are five species of Pacific salmon which occur in North American waters. They are:

1. Chinook salmon, also known as king salmon, is the largest of the five species, averaging around 20 pounds. A typical Chinook has silvery sides and a bluish-green back marked with small dark spots. The flesh of the Chinook is very rich in oil, breaks into large flakes, and ranges in color from deep salmon to almost white. It is especially good in salads.

2. Sockeye or red salmon averages about 2 feet in length and 3 to 5 pounds in weight. The males, when spawning, assume a colorful attire with a bright red body and a green head. The flesh is deep salmon in color, firm-textured, has considerable oil, and breaks into medium-sized flakes, making it suitable for salads or other dishes where richness and color are important. The annual pack of canned sockeye is usually the most valuable.

3. Pink salmon, also known as humpback salmon because of the appearance of the males during spawning, is common to Alaska but is found as far south as Oregon. Pink salmon, named for its paler flesh, ranges in weight from 3 to 6 pounds. It is especially good in entrees, soups, and sandwiches.

4. Coho or silver salmon, a favorite with fishermen, weighs from 6 to 12 pounds and is from 2 to 3 feet in length. The flesh is deep salmon, but lighter than sockeye. Coho breaks into large flakes and is equally good in all recipes or as it comes from the can. Coho salmon have recently been planted in the Great Lakes and have shown tremendous promise as a fish for sportsmen.

5. Chum salmon, also known as keta or calico salmon, migrate in the autumn and are the last Pacific salmon to run the rivers. They reach an average length up to 3 feet and weigh about 10 pounds. The flesh is lighter in color than the other species and has less oil. It is especially suitable for casseroles or other cooked dishes where color is not important. Commercially, chum salmon is the least expensive.

(Continued following page.)

HABITAT

Pacific salmon spend most of their lives in the ocean. When mature, they return to spawn in their stream of origin. Some go a short distance upstream or just above tidewater to spawn, others go as much as 2,000 miles upstream. All die after spawning. Months later the new generation emerges from the gravel. Some of the young make their way downstream immediately, others remain in fresh water for a year or two. Streams must have high-quality, well-oxygenated, cool water for salmon to survive. Pacific salmon range from Monterey Bay, California, to Alaska.

SALMON FISHING

Salmon are usually caught commercially in the ocean or in the river mouths as they begin their spawning runs. During the spawning run the salmon does not eat. Nature has provided the adults with an abundance of fats and oils for the long, rugged journey. The salmon are therefore in their prime. There are many methods used to catch salmon, but the most common are purse seining, trolling, and gill netting. Once caught, salmon are dressed and iced and are either brought directly to the cannery or transferred to cannery tenders which bring them in for processing. Much care is exercised to see that quality is maintained.

CONSERVATION

Although dams, pollution, overfishing, and other factors have reduced the numbers of salmon, it is still one of the most valuable fishery resources in the United States. BCF and the State convervation agencies are working together to enhance and protect the remaining salmon resources. Research on salmon behavior patterns and survival and the influences of environment provides an understanding of the fluctuations in abundance of salmon stocks. Research is also directed toward providing safe passage for migratory fishes at water-use projects, such as hydroelectric and flood-control dams and irrigation systems.

In the critical international North Pacific fishery, unique research tools have been developed to distinguish Asiatic from North American stocks of salmon and determine their distribution. The basic aim of all fishery research is to ensure the wise use of a renewable resource.

USES OF SALMON

Salmon is packed mainly in three different types of cans: 1. The one-pound tall and the one-pound flat, each containing two cups and serving four; 2. The half-pound flat contains one cup and serves two; 3. The "quarter-pound flat" can containing $3\frac{3}{4}$ ounces, is less common, and serves one. Because canned salmon is ideal for large scale cooking in restaurants, hospitals, institutions, etc., special four-pound cans are packed for this purpose.

Whole salmon is sold fresh or frozen for baking or barbecuing. Salmon steaks are available as are a wide range of specialty products. (Source: National Marketing Services Office, BCF, U.S. Dept. of the Interior, 100 E. Ohio, Room 526, Chicago, Ill. 60611.)

A 16-page, full-color booklet featuring salmon is available free from the Canned Salmon Institute, Pier 89, Seattle, Washington 98119. Ask for "Quick and Easy Ways With Salmon."

CAN-VENIENT SALMON SCORES AGAIN

Kids are playing baseball in the vacant lot, teen-agers are bicycling in the park, college students are strolling on campus or philosophizing on the library steps, Dad is out of the office jogging, and Mom--what is Mom doing? Mom is trying to think of a way to get out of the kitchen! Take heart, Mom, there is a way out, and the answer is seafoods! Any season is right for protein-rich, quickly prepared and cooked fish and shellfish. Especially appropriate, however, when Mom is in a hurry and wants out of the kitchen, is that versatile product, canned salmon.

Canned salmon is a fish for all seasons and truly a treat for mankind. Ready at the flick of a can-opener, canned salmon is savory, satisfying, and summery. It's also saving of those valuable commodities--time and money. There is no waste in a can of salmon. It is 100 percent edible, and even the soft, tiny bones add enjoyment and crunchy goodness. Nutritionists suggest that the entire contents in a can of salmon be used. Canned salmon adapts to many preparation methods, hot or cold, and may be eaten as it comes from the can or used in gourmet entrees.

Canned salmon varies in color from reddish to pink according to the type of salmon canned. The color helps to determine the price; the redder varieties are more expensive and have a little more oil content than the pink. All canned salmon is nutritious, however, regardless of color. Consumer-sized cans available at the market include: one-pound containing two cups and serving four; one-half pound containing one cup and serving two; and quarter-pound containing $3\frac{3}{4}$ ounces and serving one.

"Salmon, either whole, steaked, or canned, provides complete protein. It is also a good source of iodine, phosphorus, and vitamins A, D, and the B group," says Phil Roedel, Director, BCF, U.S. Department of the Interior. Take A Can Of Salmon has 22 tasty recipes ranging from appetizers to elegant entrees. For your copy, send 25¢ to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, and ask for Take A Can of Salmon, Circular No. 60.

CRUNCHY SALAD

1 can (16 ounces) salmon
Salad greens
Sliced water chestnuts
Chopped peanuts
Curry Dressing

Drain salmon and reserve liquid. Remove skin and bones. Break salmon into large pieces. Arrange salmon on salad greens. Garnish with water chestnuts and peanuts. Serve with Curry Dressing. Makes 6 servings.

CURRY DRESSING

$\frac{3}{4}$ cup mayonnaise or salad dressing
$\frac{1}{2}$ cup sliced green onion
$\frac{1}{3}$ cup chopped green pepper
2 tablespoons salmon liquid
1 tablespoon soy sauce
1 teaspoon curry powder
$\frac{1}{8}$ teaspoon ground ginger

Combine all ingredients. Chill. Makes approximately 12 cups dressing.

(National Marketing Services Office, BCF, U.S. Department of the Interior, 100 East Ohio Street, Room 526, Chicago, Illinois 60611.)

KING CRAB KRUNCH--ALASKA SPECIALTY

The Pacific coast offers great seafoods, and many of them come from Alaska, the 49th and biggest State, a land of superlatives and surprises. Superlative not only describes Alaska, it is the best word to describe one of Alaska's famous products, the king of crabs. Caught in the cold waters of the Bering Sea off Alaska's rugged coastline, the huge king crabs are processed and packaged on board ship within minutes after being caught.

King Crab Crunch is a Bureau of Commercial Fisheries recipe that allows the homemaker to "go gourmet" with ease and convenience. All ingredients are refrigerator or shelf-ready, planned to save time in preparation. Big, tender, succulent pieces of king crabmeat are mixed with celery and pineapple pieces, then blended and heated together in a chicken broth base. Add toasted slivered almonds and a little lemon juice just before serving over chow mein noodles--then sit back and take time to enjoy this crunchy, delicious seafood recipe. Great for entertaining or a special treat for the family, this king crab specialty offers real nourishment and is bound to be a nifty success every time it is served.

KING CRAB KRUNCH

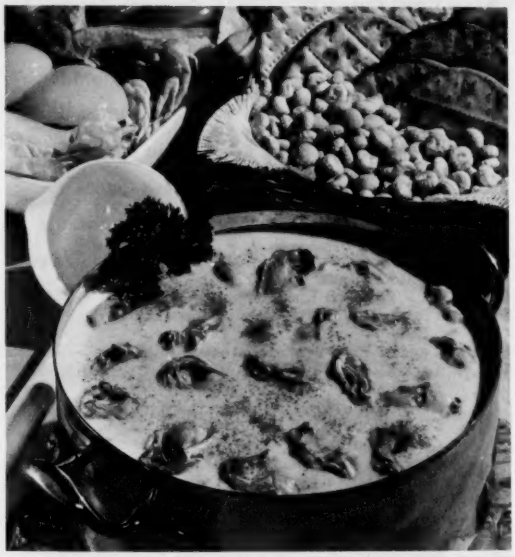
1 pound king crabmeat, fresh or frozen
1 can (8¾ ounces) crushed pineapple
3 tablespoons butter or margarine
½ cup thinly sliced celery
2 tablespoons cornstarch
2 cups chicken broth
½ cup toasted blanched slivered almonds
1 tablespoon lemon juice
1 can (5 ounces) chow mein noodles

Thaw frozen crabmeat. Drain crabmeat. Remove any remaining shell or cartilage. Drain pineapple, reserving liquid. Melt butter in a 10-inch fry pan. Add celery, pineapple, and crabmeat. Cook over low heat for 5 minutes, stirring frequently. Dissolve cornstarch in pineapple juice. Stir into crab mixture. Add chicken broth gradually and cook until thick, stirring constantly. Add almonds and lemon juice. Serve over noodles. Makes 6 servings.

King Crab Krunch is one of 25 mouth-watering, easy-fix recipes planned especially to give you TIME--time to enjoy, time to relax, and time out of the kitchen. Cooking with imagination is so easy to do with 'Time For Seafood,' a full color booklet published by the Bureau of Commercial Fisheries. For your copy send 45¢ to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 and ask for Time For Seafood, Fishery Market Development Series No. 12 (I 49.49/2:12). (National Marketing Services Office, BCF, U.S. Department of the Interior, 100 East Ohio Street, Rm. 526, Chicago, Illinois 60611.)

OYSTERS ARE IN A STEW AGAIN!

Oysters have been pleasing and nourishing mankind for hundreds of years. Coastal Indians enjoyed them in large quantities as evidenced by great piles of oyster shells found along the shorelines by early settlers. Oysters today are more popular than ever, and the old superstition of eating oysters only in the "R" months has long been disproved. Oysters are good to eat anytime they are available. Fortunately for oyster fanciers they can be enjoyed the year around thanks to today's modern freezing and canning processes. Right now, however, these tasty little gems are plentiful and available fresh, sweet, and ready to eat.



Oyster meats are excellent sources of protein, minerals, and vitamins, and they are easily digested. Because of the high mineral content, oysters are often recommended by doctors for patients with anemia. To retain the oyster's delicate flavor never overcook. Oysters should be cooked just long enough to heat through so they will remain plump and tender.

Soup is super--especially when oysters are in the soup. Oysters are delightful prepared in dozens of versatile ways, but now is the season to enjoy them in soups and stews. Poets have said that oyster stew nourishes the soul; whether it does or not is debatable, but we do know that it nourishes the body. Oyster-Mushroom Stew, a Bureau of Commercial Fisheries recipe, has all the goodness of the traditional oyster stew but with a modern touch. This recipe combines the succulent oysters with milk and canned cream of mushroom soup for a hurry-up snack, lunch, or first course. A last minute addition of sherry adds a flavor fillip to make this easy combination one you'll repeat again and again. Served with a cling peach salad and your choice of crackers, this Oyster-Mushroom Stew is a boon to today's busy homemakers--ready in minutes, tasty and filling, and bound to satisfy.

OYSTER-MUSHROOM STEW

2 cans (12 ounces each) oysters, fresh or frozen
1 can (10½ ounces) cream of mushroom soup
2 cups oyster liquor and milk
½ teaspoon salt
¼ cup butter or margarine
1 tablespoon sherry
Paprika

Thaw frozen oysters. Drain oysters and reserve liquor. Combine all ingredients except oysters and sherry in a 3-quart saucepan. Heat, stirring occasionally. Add oysters. Heat 3 to 5 minutes longer or until edges of oysters begin to curl. Add sherry. Sprinkle with paprika. Makes 6 servings.

Fishery products from Washington, Oregon, and Alaska offer 38,340 miles of variety, flavor, and imagination. To call attention to these products the United States Department of the Interior's Bureau of Commercial Fisheries, in cooperation with eight fishery agencies in the Pacific Northwest, has produced a new, 32-page, full-color booklet that is chock-full of wonderful ways with seafoods. For your copy of this exciting recipe booklet send 60¢ to the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 and ask for Seafood Moods, Fishery Market Development Series No. 14. (Source: National Marketing Services Office, BCF, U. S. Department of the Interior, 100 East Ohio Street, Rm. 526, Chicago, Illinois 60611.)

INDEX

UNITED STATES DEPARTMENT OF THE INTERIOR

Walter J. Hickel, *Secretary*

Fred J. Russell, *Under Secretary*

Leslie L. Glasgow, *Assistant Secretary for Fish and Wildlife and Parks*

Charles H. Meacham, *Commissioner*, U.S. FISH AND WILDLIFE SERVICE

Philip M. Roedel, *Director*, BUREAU OF COMMERCIAL FISHERIES

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

BACK COVER: Alaskan shrimp are transferred from this boat-loaded box to bins at processing plant, where crushed ice will hold them until processed.
(BCF-ALASKA photo: J. M. Olson)